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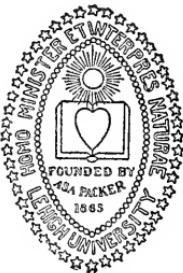
MARCH, 1933

No. 5

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REGISTER, 1932-1933

ANNOUNCEMENT, 1933-34



BETHLEHEM
PENNSYLVANIA

1932						1933						1934							
JULY			JANUARY			JULY			JANUARY			JANUARY			JANUARY				
S	M	T	W	T	F	S	S	M	T	W	T	S	S	M	T	W	T	F	
3	4	5	6	7	8	9	1	2	3	4	5	6	7	1	2	3	4	5	
10	11	12	13	14	15	16	15	16	17	18	19	20	21	22	23	24	25	26	
17	18	19	20	21	22	23	22	23	24	25	26	27	28	29	30	31	31	31	
24	25	26	27	28	29	30	29	30	31	... ..	... ..	... ..	... ..	... ..	... ..	... ..	... ..	... ..
31	... ..	... ..	... ..	... ..	... ..	... ..	30	31	... ..	... ..	... ..	... ..	... ..	30	31	... ..	... ..	... ..
AUGUST						FEBRUARY						AUGUST						FEBRUARY	
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
7	8	9	10	11	12	13	5	6	7	8	9	10	11	12	4	5	6	7	8
14	15	16	17	18	19	20	12	13	14	15	16	17	18	19	13	14	15	16	17
21	22	23	24	25	26	27	19	20	21	22	23	24	25	26	20	21	22	23	24
28	29	30	31	... ..	... ..	... ..	26	27	28	... ..	... ..	... ..	... ..	... ..	27	28	29	30	31
SEPTEMBER						MARCH						SEPTEMBER						MARCH	
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
4	5	6	7	8	9	10	5	6	7	8	9	10	11	12	3	4	5	6	7
11	12	13	14	15	16	17	12	13	14	15	16	17	18	19	10	11	12	13	14
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25	26	27	28	29	30	26	27	28	29	30	31	24	25	26	27	28
OCTOBER						APRIL						OCTOBER						APRIL	
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
2	3	4	5	6	7	8	2	3	4	5	6	7	8	9	1	2	3	4	5
9	10	11	12	13	14	15	9	10	11	12	13	14	15	16	15	16	17	18	19
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23	24	25	26	27	28	29	23	24	25	26	27	28	29	30	30	31
NOVEMBER						MAY						NOVEMBER						MAY	
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
6	7	8	9	10	11	12	7	8	9	10	11	12	13	14	5	6	7	8	9
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27	28	29	30	31	28	29	30	31	29	30	31
DECEMBER						JUNE						DECEMBER						JUNE	
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
4	5	6	7	8	9	10	4	5	6	7	8	9	10	11	1	2	3	4	5
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18	19	20	21	22	23	24	18	19	20	21	22	23	24	25	10	11	12	13	14
25	26	27	28	29	30	31	25	26	27	28	29	30	31	31	17	18	19	20	21

UNIVERSITY CALENDAR

1932-1933

1932

Sept. 8, 9, 10, 12 (Thurs.-Mon.)	Examinations for admission
Sept. 12, 3:00 p.m. (Mon.)	First faculty meeting
Sept. 13, 14, 15, 16, 17 (Tues.-Sat.)	Freshman week
Sept. 13, 14, 15, 16, 17 (Tues.-Sat.)	Fall re-examinations
Sept. 19, 20, 21 (Mon., Tues., Wed.)	Undergraduate registration
Sept. 22, 7:45 a.m. (Thurs.)	First Semester begins
Sept. 24 (Sat.)	Graduate registration
Oct. 3 (Mon.)	Last day for undergraduate registration
Oct. 5 (Wed.)	Founder's Day (holiday)
Oct. 15 (Sat.)	Last day for graduate registration
Nov. 10 (Thurs.)	Mid-semester reports
Nov. 23, 4:00 p.m. (Wed.)	Thanksgiving holidays begin
Nov. 28, 7:45 a.m. ^b (Mon.)	Thanksgiving holidays end
Dec. 21, 4:00 p.m. (Wed.)	Christmas holidays begin

1933

Jan. 5, 7:45 a.m. (Thurs.)	Christmas holidays end
Jan. 18, 12:00 m. (Wed.)	Instruction ends
Jan. 19, 8:00 a.m. (Thurs.)	Examinations begin
Jan. 28, 6:00 p.m. (Sat.)	Examinations end
Jan. 31, Feb. 1 (Tues., Wed.)	Undergraduate registration
Feb. 2, 7:45 a.m. (Thurs.)	Second Semester begins
Feb. 11 (Sat.)	Graduate registration
Feb. 13 (Mon.)	Last day for undergraduate registration
Mar. 4 (Sat.)	Last day for graduate registration
Mar. 24 (Fri.)	Mid-semester reports
Apr. 12, 4:00 p.m. (Wed.)	Easter holidays begin
Apr. 20, 7:45 a.m. (Thurs.)	Easter holidays end
May 22, 23, 24 (Mon., Tues., Wed.)	Senior Arts comprehensive examinations
May 24, 12:00 m. (Wed.)	Instruction ends
May 25, 8:00 a.m. (Thurs.)	Examinations begin
June 3, 6:00 p.m. (Sat.)	Examinations end
June 5 (Mon.)	Summer engineering courses begin
June 8, 9 (Thurs., Fri.)	Senior re-examinations
June 10 (Sat.)	Alumni Day
June 11 (Sun.)	Baccalaureate Sunday
June 12 (Mon.)	Class Day
June 13 (Tues.)	University Day
June 14, 15, 16, 17 (Wed.-Sat.)	Examinations for admission
July 1 (Sat.)	Summer engineering courses end
July 3 (Mon.)	Summer session begins
July 3 (Mon.)	Second surveying camp begins
July 15 (Sat.)	Second surveying camp ends
Aug. 12 (Sat.)	Summer session ends

UNIVERSITY CALENDAR—Continued

1933-1934

1933

Sept. 7, 8, 9, 11 (Thurs.-Mon.)	Examinations for admission
Sept. 11, 3:00 p.m. (Mon.)	First faculty meeting
Sept. 12, 13, 14, 15, 16 (Tues.-Sat.)	Freshman Week
Sept. 12, 13, 14, 15, 16 (Tues.-Sat.)	Fall re-examinations
Sept. 18, 19, 20 (Mon., Tues., Wed.)	Undergraduate registration
Sept. 21, 7:45 a.m. (Thurs.)	First Semester begins
Sept. 23 (Sat.)	Graduate registration
Sept. 25 (Mon.)	Last day for filing applications for degrees to be conferred on Founder's Day
Oct. 2 (Mon.)	Last day for undergraduate registration
Oct. 4 (Wed.)	Founder's Day (holiday)
Oct. 14 (Sat.)	Last day for graduate registration
Nov. 9 (Thurs.)	Mid-semester reports
Nov. 29, 4:00 p.m. (Wed.)	Thanksgiving holidays begin
Dec. 4, 7:45 a.m. (Mon.)	Thanksgiving holidays end
Dec. 20, 4:00 p.m. (Wed.)	Christmas holidays begin

1934

Jan. 4, 7:45 a.m. (Thurs.)	Christmas holidays end
Jan. 17, 12:00 m. (Wed.)	Instruction ends
Jan. 18, 8:00 a.m. (Thurs.)	Examinations begin
Jan. 27, 6:00 p.m. (Sat.)	Examinations end
Jan. 30, 31 (Tues., Wed.)	Undergraduate registration
Feb. 1, 7:45 a.m. (Thurs.)	Second Semester begins
Feb. 3 (Sat.)	Graduate registration
Feb. 12 (Mon.)	Last day for undergraduate registration
Feb. 24 (Sat.)	Last day for graduate registration
Mar. 23 (Fri.)	Mid-semester reports
Mar. 28 4:00 p.m. (Wed.)	Easter holidays begin
Apr. 5, 7:45 a.m. (Thurs.)	Easter holidays end
May 15 (Tues.)	Last day for filing applications for degrees to be conferred on University Day
May 21, 22, 23 (Mon., Tues., Wed.)	Senior Arts comprehensive examinations
May 23, 12:00 m. (Wed.)	Instruction ends
May 24, 8:00 a.m. (Thurs.)	Examinations begin
June 2, 6:00 p.m. (Sat.)	Examinations end
June 4 (Mon.)	Summer engineering courses begin
June 7, 8 (Thurs., Fri.)	Senior re-examinations
June 9 (Sat.)	Alumni Day
June 10 (Sun.)	Baccalaureate Sunday
June 11 (Mon.)	Class Day
June 12 (Tues.)	University Day

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CEDRIC GALE, A.B., M.A.
Instructor in English

VORIS V. LATSHAW, B.A., A.M., PH.D.
Instructor in Mathematics

CHARLES WESLEY PHY, B.A., M.A.
Instructor in Journalism

BENJAMIN LICHTY SNAVELY, B.S. IN ENG. PHYS.
Instructor in Physics

DANIEL BORTH, JR., B.S., M.S., PH.D.
Instructor in Economics

JOE WEBB PEOPLES, B.A., M.S., PH.D.
Instructor in Geology

ASSISTANTS

FRED JOHN MOHRING, MASTER SERGT., D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

JAMES MAHONEY
Assistant in Swimming

GEORGE FRANCIS GASDA, SERGT., D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

CARES CREIGHTON KEYSER, C.E.
Laboratory Assistant in Civil Engineering

HENRY GEORGE SWAIN, A.B., M.A.
Graduate Assistant in Mathematics

JAMES WENDELL BURGER, A.B.
Assistant in Biology

ALBERT PADDOCK CRARY, B.S.
Graduate Assistant in Physics

JOHN EDWIN FREEHAFER, B.S. IN ENG. PHYS.
Graduate Assistant in Mathematics

ARTHUR PARKER HELMS, B.A.
Assistant in English

HENRY CHARLES KELLY, B.S. IN ENG. PHYS.
Graduate Assistant in Physics

KENNETH KARL KOST, B.A.
Assistant in English

LEO MARTIN O'BRIEN, STAFF SERGT., D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

WALTER BARTON COLEMAN, A.B.
Graduate Assistant in Mathematics

THEODORE GEORGE EHRSAM, B.A., M.A.
Assistant in English

CLYDE ALBERT HARDING, B.A., M.A.
Assistant in English

EMERSON WERTZ KAUFMANN, B.S. IN CH.E.
Graduate Assistant in Chemistry

BENJAMIN FRANKLIN MINER, JR., A.B., A.M.
Assistant in German

RESEARCH FELLOWS

ALFRED NATHAN ROGERS, B.S. IN CH.E., M.S.
Textile Foundation Fellow

ALTON RICHARD BEALL, B.A.
*Archer-Daniels-Midland Company and William O. Goodrich
Company Research Fellow*

GEORGE ELLSWORTH COOPER, B.S. IN CH.E.
*Archer-Daniels-Midland Company and William O. Goodrich
Company Research Fellow*

ELMER BENJAMIN CYPHERS, B.S. IN CH.E.
*Archer-Daniels-Midland Company and William O. Goodrich
Company Research Fellow*

ELMER CHARLES EASTON, B.S. IN E.E.
*James Ward Packard Research Fellow in Electrical
Engineering*

SAMUEL WROATH FARRELL, B.S. IN CH.E.
New Jersey Zinc Company Research Fellow

HOWARD JOHNSON GODFREY, B.S. IN C.E.
Lehigh Institute of Research Fellow in Civil Engineering

JOHN MATHEWSON GRAHAM, B.S. IN CH.E.
Hunt-Rankin Leather Company Research Fellow

JAMES FRANCIS HOUSER, B.S. IN M.E.
*Lehigh Institute of Research Fellow in Mechanical
Engineering*

CHARLES AUGUST JEANSON, III, B.S. IN CH.E.
Student Chemistry Foundation Fellow

ERNST JACOB KLINGER, B.S. IN CH.E.
Lehigh Institute of Research Fellow in Chemistry

FRANK BERNARD LUCAS, B.S. IN E.E.
H. M. Byllesby Research Fellow in Electrical Engineering

FRANCIS PATRICK SHANNON, B.S., B.S. IN M.E.
*C. Kemble Baldwin Research Fellow in Aeronautic
Engineering*

JOHN DAVID BRANDNER, B.S. IN CH.E.

Student Chemistry Foundation Fellow

WILLIAM CHARLES FRITZ, B.S. IN CHEM.

Eavenson and Levering Company Research Fellow

CHARLES EVERARD JOSEPH GREEN, B.S. IN CH.E.

Hunt-Rankin Leather Company Research Fellow

WILLIAM ASA GREEN, B.S.

Lehigh Institute of Research Fellow in Bacteriology

BRUCE JOHNSTON, B.S.

Lawrence Calvin Brink Research Fellow in Civil Engineering

MAX KANTOR, B.S. IN CH.E.

Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

PHILIP BENHAM MYERS, A.B.

Lehigh Institute of Research Fellow in Geology

HARRY BROOKS OSBORN, JR., B.S. IN CH.E.

H. M. Byllesby Research Fellow in Chemical Engineering

BENJAMIN RABINOWITZ, B.S. IN CH.E.

Lehigh Institute of Research Fellow in Chemistry

ALBERT MONFORTE THORNE, JR., B.S. IN ENG. PHYS.

Lehigh Institute of Research Fellow in Physics and Metallurgy

COMMITTEES OF THE FACULTY

(The term of each member expires in June of the year given in parenthesis after his name. The President is ex officio a member of all committees)

ADMISSIONS: Dean McConn (*ex officio*), Registrar Curtis (*ex officio*), Professors S. A. Becker (1933), Fox (1934), More (1935), H. P. Thomas (1936), Smail (1937), Bayley (1938), Ford (1939).

ADVANCED STANDING: Registrar Curtis (*ex officio*), Professors Bradford (1933), Babasinian (1934), Diefenderfer (1935), Luch (1936).

ATHLETICS (FACULTY MEMBERS OF THE BOARD OF CONTROL OF ATHLETICS): Professors Reiter (*ex officio*), Carothers (1933), Petersen (1934), Beaver (1935).

CHAPEL: Professors Beardslee (*ex officio*), Klein (1933), Reynolds (1934), Hall (1935), Schulz (1936), Crum (1937).

DISCIPLINE: Dean McConn (*ex officio*), Professors More (1933), Cowin (1934), Butterfield (1935), and one student member: C. F. Halsted, Jr.

EDUCATIONAL POLICY: Professors Eckfeldt (1933), Carothers (1934), Palmer (1935), Sutherland (1936), Seyfert (1937).

FACULTY EDUCATIONAL CLUB: Professors Beardslee, Bidwell, Gipson, F. C. Becker, Billinger, H. P. Thomas.

HONORARY DEGREES: Professors Gipson (1933), B. L. Miller (1934), Ullmann (1935), Vice-President Emery (1936), Professors Stoughton (1937), F. V. Larkin (1938).

HOUSE COMMITTEE, DROWN MEMORIAL HALL: Professor Beardslee and two student members: J. W. Shelhart, W. H. C. Webster.

INSPECTION TRIPS: Professors Stuart (1933), Anderson (1934), Hibshman (1935), Butts (1936), Sinkinson (1937).

LIBRARY: Librarian Leach (*ex officio*), Professors Diamond (1933), Bidwell (1934), B. L. Miller (1935), Fort (1936).

PETITIONS: Dean McConn (*ex officio*), Registrar Curtis (*ex officio*), Professors Bishop (1933), Payrow (1934), Luce (1935).

PUBLICATIONS, BOARD OF: Dean McConn (*ex officio*), Professors Howland (1933), Jensen (1934), and three student members: W. R. Lathrop, H. J. O'Brien, J. A. Tempest.

ROSTER: Registrar Curtis (*ex officio*), Professors Neville (1933), Cowin (1934), Harmon (1935), Doan (1936).

STANDING OF STUDENTS: Dean McConn, Registrar Curtis, Professors Palmer, Carothers, Ullmann, Sutherland, Seyfert, Bidwell, F. V. Larkin, Stoughton, Eckfeldt (all members *ex officiis*).

STUDENT ACTIVITIES: Dean McConn (*ex officio*), Professors Fretz* (1933), Diamond (1934), and three student members: J. S. McElwain, F. F. Rohrer, H. P. Zabriskie.

STUDENT CLUBS: Dean McConn (*ex officio*), Professors H. C. Brown (1933), Anderson (1934), and three student members: J. H. Frye, Jr., J. F. Garber, M. M. Reed, Jr.

SUMMER SESSION: Vice-President Emery (*ex officio*), Professors Reynolds (1933), Smith (1934), Fuller (1935), Jennings (1936), Stocker (1937).

* Absent on leave, Prof. Diefenderfer serving.

OFFICERS OF ADMINISTRATION**Office of the President**

CHARLES RUSS RICHARDS, M.M.E., ENG.D., LL.D., *President*

Office of the Vice-President and Comptroller

NATT MORRILL EMERY, A.B., M.A., LITT.D., *Vice-President and Comptroller*

FREDERICK RALPH ASHBAUGH, *Bursar and Purchasing Agent*

MELVIN SCHISSLER, C.P.A., *Bookkeeper*

ENGLEBERT HENRY BADERSCHNEIDER, M.E., *Manager of Supply Bureau*

Office of the Dean

CHARLES MAXWELL McCONN, B.A., M.A., LITT.D., *Dean*

GEORGE BARTLETT CURTIS, B.A., A.M., *Associate Dean*

Office of the Registrar

GEORGE BARTLETT CUBTIS, B.A., A.M., *Registrar*

GEORGE WILLIS ELY, B.S. IN BUS. AD., *Assistant to the Registrar*

JEANETTE CLEAVELAND, *Recorder*

Directors of Curricula

PHILIP MASON PALMER, A.B., *Director of the College of Arts and Science*

NEIL CAROTHERS, B.A., PH.D., *Director of the College of Business Administration*

HARRY M. ULLMANN, A.B., PH.D., *Director of the Curricula in Chemistry and Chemical Engineering*

HALE SUTHERLAND, A.B., S.B., *Director of the Curriculum in Civil Engineering*

STANLEY SYLVESTER SEYFERT, E.E., M.S., Sc.D., *Director of the Curriculum in Electrical Engineering*

CHARLES CLARENCE BIDWELL, A.B., PH.D., *Director of the Curriculum in Engineering Physics*

FRED VIALL LARKIN, B.S., M.E., *Director of the Curricula in Mechanical Engineering and Industrial Engineering*

BRADLEY STOUGHTON, PH.B., B.S., *Director of the Curriculum in Metallurgical Engineering*

HOWARD ECKFELDT, B.S., E.M., *Director of the Curriculum in Mining Engineering*

Summer Session

NATT MORRILL EMERY, A.B., M.A., LITT.D., *Director*

Faculty

GEORGE BARTLETT CURTIS, B.A., A.M., *Secretary*

Legal Counsel

ROBERT SAYRE TAYLOR, B.S., *Legal Counsel*

Linderman Memorial Library

HOWARD SEAVOY LEACH, A.B., M.A., *Librarian*

MARY ELIZABETH WHEATLEY, A.B., A.M. *Cataloguer*

ELIZABETH BAER HAY, A.B., B.S. IN L.S., *Circulation Desk Attendant*

MYRTLE LAURA HELMS, A.B., *Assistant Desk Attendant*

MARGARET LARAMY MEAKER, B.A., B.S. IN L.S., M.A., *First Assistant Cataloguer*

ISABEL ARDERY BOONE TREMBLEY, A.B., B.S. IN L.S., *Assistant Cataloguer*

ROBERT F. RILEY, *Clerk*

Packer Memorial Church

THE REV. CLAUDE GILLETTE BEARDSLEE, B.A., B.D., M.A., S.T.M., PH.D., *Chaplain*

THOMAS EDGAR SHIELDS, A.A.G.O., *Organist*

Students' Health Service

RAYMOND COOLEY BULL, B.S., A.B., M.D., *Director*

STEWART LEEDS RANKIN, B.S., M.D. *Assistant Director*

MRS. JENNIE VYE DACEY, R.N., *Nurse in charge of Dispensary*

HARRY FREDERICK HOFFMAN, M.D., *Consultant in Mental Hygiene*

WILLIAM MICHAEL BURKHARDT, *Masseur*

Board of Control of Athletics

JACOB GRAFIUS PETRIKIN, B.S., *Graduate Manager of Athletics*

University Band

THOMAS EDGAR SHIELDS, A.A.G.O., *Director*

Promotion and Publicity

ANDREW EDWARD BUCHANAN, JR., CH.E., *Director*

Office of Superintendent of Buildings and Grounds

ANDREW WILLARD LITZENBERGER, *Superintendent of Buildings and Grounds*

JOHN DAVID HARTIGAN, *Superintendent of the Power Plant*

Alumni Association

ANDREW EDWARD BUCHANAN, JR., CH.E., *Executive Secretary*

JOHN ANDRE BRODHEAD, M.E., M.A., *Director of Placement Service*

JOHN WALTER MAXWELL, B.S. IN BUS. AD., *Assistant Editor, Alumni Bulletin*

Standing Committees

ART EXHIBITIONS: Professors Palmer, Howland, Librarian Leach, Vice-President Emery.

GRADUATE BOARD: President Richards (*ex officio*), Dean McConn (*ex officio*), Professors S. J. Thomas, Carothers, Smith, Larkin, Miller, More (*Executive Secretary*), Gipson, Hughes, Seyfert, Fort, Bidwell, Sutherland, Long, H. P. Thomas.

INSTITUTE OF RESEARCH: President Richards (*ex officio*), Professors Ullmann, Sutherland, Seyfert, Larkin, Stoughton, Eckfeldt, Bidwell, Miller, Hall, Carothers, Gipson.

LECTURES: Professors S. M. Brown (1933), Stuart (1933), Reynolds (1934), Registrar Curtis (1934), Professors Smith (1935), Hibshman (1935).

MENTAL HYGIENE: Professor Hughes, Dean McConn, Dr. Bull, Dr. Hoffman.

REGISTER: Vice-President Emery, Registrar Curtis, Professors Smith, Cowin, Wilson.

SCHOLARSHIPS AND LOANS: Vice-President Emery, Dean McConn, Treasurer Okeson.

TEACHER PLACEMENT: Professors H. P. Thomas, Hughes, Dean McConn, Professors Palmer, Ullmann, Mr. Brodhead.

WILLIAMS SENIOR PRIZE: Professors Smith, Palmer, Hughes, Carothers, Ford.

REQUIREMENTS FOR ADMISSION

Candidates for admission to Lehigh University must be at least sixteen years of age, must present testimonials of good moral character, and must be qualified in fifteen entrance units as enumerated below. The University reserves the right to require any candidate for admission to present himself for a personal interview and to select candidates otherwise qualified on the basis of such an interview. Women are not admitted to the work of the first semester or of the second semester either as undergraduate students or as special students. No registration is accepted later than the tenth day of instruction.

All students entering the University are required to present a certificate of vaccination against small-pox within three years of the time of entering the University. They must also have a scar as evidence of previous successful vaccination. Students who cannot comply with this regulation are vaccinated by the director of the Health Service, and in case the vaccination is unsuccessful are re-vaccinated.

THE COLLEGE OF ARTS AND SCIENCE

Candidates for admission to the College of Arts and Science must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2
History,	1
Elementary Algebra,	1
Intermediate Algebra,	$\frac{1}{2}$
Plane Geometry,	1
Elective subjects,	$6\frac{1}{2}$
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	15

THE COLLEGE OF BUSINESS ADMINISTRATION

Candidates for admission to the College of Business Administration must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2

History,	1
Elementary Algebra,	1
Intermediate Algebra,	$\frac{1}{2}$
Plane Geometry,	1
Elective subjects,	$6\frac{1}{2}$
	—
	15

THE COLLEGE OF ENGINEERING

Candidates for admission to the College of Engineering must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2
History,	1
Elementary Algebra,	1
Intermediate Algebra,	$\frac{1}{2}$
Plane Geometry,	1
Solid Geometry or Advanced Algebra	$\frac{1}{2}$
Plane Trigonometry and Logarithms,	$\frac{1}{2}$
Elective subjects,	$5\frac{1}{2}$
	—
	15

ELECTIVE SUBJECTS

	Units*
English, fourth year,	1
Intermediate Algebra, second semester,	$\frac{1}{2}$
Advanced Algebra,	$\frac{1}{2}$
Solid Geometry,	$\frac{1}{2}$
Plane Trigonometry and Logarithms,	$\frac{1}{2}$
Greek,	1, 2, or 3
Latin,	1, 2, 3, or 4
French,	1, 2, 3, or 4
German,	1, 2, 3, or 4
Spanish,	1, 2, 3, or 4
American History,	1

* A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of forty minutes each or the equivalent.

Ancient History,	$\frac{1}{2}$ or 1
Mediaeval and Modern History,	1
English History,	$\frac{1}{2}$ or 1
Civics,	$\frac{1}{2}$, 1, or $1\frac{1}{2}$
Economics,	$\frac{1}{2}$ or 1
General Science,	1
Physics,	1 or 2
Chemistry,	1 or 2
Biology,	$\frac{1}{2}$, 1 or 2
Botany,	$\frac{1}{2}$ or 1
Zoology,	$\frac{1}{2}$ or 1
Physiography,	$\frac{1}{2}$ or 1
Industrial History,	$\frac{1}{2}$ or 1
Business Law,	$\frac{1}{2}$ or 1
Commercial Geography,	$\frac{1}{2}$ or 1

Applicants may also elect not more than two units from the following supplementary list:

Physiology and Hygiene,	$\frac{1}{2}$ or 1
Manual Training,	$\frac{1}{2}$ or 1
Freehand Drawing,	$\frac{1}{2}$
Mechanical Drawing,	$\frac{1}{2}$
Bookkeeping, Stenography, and Typewriting,	1 or 2

Other subjects from the curriculum of a high school of the first class may be credited up to a total of one unit.

ADMISSION BY CERTIFICATE

Lehigh University has no permanent arrangement with any school whereby certificates are accepted in place of entrance examinations; but certificates are ordinarily accepted from first-class high schools in Pennsylvania, and from schools accredited by the Association of Colleges and Secondary Schools of the Middle States and Maryland, the New England College Entrance Certificate Board, the Regents of the University of the State of New York, the North Central Association of Colleges and Secondary Schools, the Association of Colleges and Secondary Schools of the Southern States, and the state universities of those states having such institutions.

* A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of forty minutes each or the equivalent.

Upon completion of his course an applicant for admission by certificate should request his school principal to send to the Registrar a complete record of his work. Blanks for this purpose are supplied by the University.

Each candidate for admission must present full school and college records from each institution previously attended; failure to present such records will result in cancellation of registration.

ADMISSION BY EXAMINATION

Examinations at the University

Examinations for admission to the University will be held in 1933 as follows:

Algebra, Elementary	June 16, Sept.	9,	2:00 p.m.
Algebra, Intermediate	June 16, Sept.	9,	4:00 p.m.
Algebra, Advanced	June 15, Sept.	8,	2:00 p.m.
Biology	June 14, Sept.	7,	8:30 a.m.
Business Law	June 15, Sept.	8,	2:00 p.m.
Chemistry	June 14, Sept.	7,	8:30 a.m.
Civics	June 15, Sept.	8,	2:00 p.m.
Economics	June 15, Sept.	8,	2:00 p.m.
English	June 15, Sept.	8,	8:30 a.m.
French	June 17, Sept.	11,	8:30 a.m.
General Science	June 14, Sept.	7,	8:30 a.m.
Geometry, Plane	June 16, Sept.	9,	8:30 a.m.
Geometry, Solid	June 16, Sept.	9,	10:30 a.m.
German	June 17, Sept.	11,	8:30 a.m.
History			
American	June 14, Sept.	7,	2:00 p.m.
Ancient	June 16, Sept.	9,	8:30 a.m.
English	June 16, Sept.	9,	2:00 p.m.
Mediaeval and Modern	June 14, Sept.	7,	2:00 p.m.
Latin	June 17, Sept.	11,	8:30 a.m.
Physics	June 14, Sept.	7,	2:00 p.m.
Physiology	June 14, Sept.	7,	8:30 a.m.
Spanish	June 17, Sept.	11,	8:30 a.m.
Trigonometry	June 15, Sept.	8,	2:00 p.m.
Zoology	June 14, Sept.	7,	8:30 a.m.

Examinations in other subjects presented for elective units may be arranged by correspondence with the Registrar.

Candidates for admission who wish to take examinations for advanced credit in any subjects should notify the Registrar before September 1.

Examinations at Schools

Upon the request of school principals the June entrance examinations may be held at schools on the regularly scheduled dates. Requests for examination papers should be sent to the Registrar before June 1.

College Board Examinations

Certificates of the College Entrance Examination Board are accepted in subjects in which the recorded grade is 60 per cent or higher.

The examinations of the College Entrance Examination Board are held in June of each year. Information in regard to these examinations, application blanks, and a circular giving detailed definitions of requirements in all examinations may be obtained from the College Entrance Examination Board, 431 West 117th Street, New York, N.Y.

ADMISSION TO ADVANCED STANDING

A student who desires to transfer to Lehigh University from another college or university must submit an official transcript of his record in the other institution; this certificate should include his college credits, a list of the entrance credits accepted for admission to that other institution, and a statement of honorable dismissal.

A candidate for admission to Lehigh University with advanced standing must meet the entrance requirements prescribed for undergraduates. In the event that the entrance credits presented for admission to the former institution do not meet the entrance requirements of Lehigh University in full, subjects which have been taken in college may be presented to make up the deficiencies. No student is admitted to Lehigh University who is not eligible to continue in good scholastic standing at the institution from which he is transferring.

A candidate who has attended more than one college or university must present a record from each institution; failure to submit a complete record of former academic experience will result in cancellation of registration.

Graduates of other colleges are admitted to Lehigh University without examinations. The length of time for the completion of a curriculum depends upon the student's attainments at entrance and upon his ability. Graduates of recognized colleges of liberal arts and sciences whose courses have included a year of physics, a year of chemistry, and mathematics through the calculus are admitted to the College of Engineering with junior standing, and may expect to receive the degree of B.S. in Engineering on the successful completion of a two year program which will be individually planned for each candidate.

A student who intends to take an engineering curriculum at Lehigh University after graduation from college should so arrange his work in college as to cover as many as possible of the subjects of the freshman and sophomore years of the engineering curriculum he selects.

ADMISSION OF SPECIAL STUDENTS

Special students may be admitted on recommendation of the directors of curricula and upon approval of the Dean. Candidates must be at least twenty-one years of age and must present evidence of ability to pursue with profit the subjects that they wish to study at the University.

ADMISSION TO GRADUATE COURSES

A student who has taken the bachelor's degree or a degree in technology at any recognized college, university, or technical institution may be admitted as a graduate student and by permission of the Graduate Board may pursue studies leading to the degree of Master of Arts or Master of Science under the following regulations:

1. All work which is to be credited toward a master's degree must be done in actual and regular attendance at the University.
2. A minimum of thirty semester hours is required for the master's degree.

3. Each graduate student must submit for approval of the Graduate Board the program of courses he proposes to take to satisfy the requirements for the master's degree.

4. At least eighteen of the required thirty semester hours must be taken in one department. The remaining twelve hours are ordinarily taken in one or two other departments; but, with the approval of the Graduate Board, the entire thirty hours may be taken in a single department. In all cases, however, the work must be taken under at least two instructors, and the distribution of the work shall be made upon the advice and with the approval of the head of the major department.

5. At least twelve of the eighteen semester hours required in the major department and at least fifteen of the thirty semester hours required for the degree must be taken in courses open primarily to graduates.

6. A thesis may be required by the major department. If required, the thesis shall not count for more than six semester hours. Two bound typewritten copies of the thesis (one of which shall be an original copy), approved by the head of the major department, shall be placed in the hands of the secretary of the Graduate Board at least two weeks before the day on which the degree is to be conferred. The form of the thesis must conform to the specifications that have been established by the Graduate Board. Full information concerning these specifications may be obtained from the Librarian of the University or from the secretary of the Graduate Board.

7. The Master's degree is not granted unless the candidate has earned the grade A or B in at least three-fifths of his work. No course in which the grade earned is less than C counts toward the degree.

8. Candidates employed as full-time teachers in the University may not take more than six hours of graduate work in any one semester.

9. Tuition for graduate courses is at the rate of \$10.00 a semester hour.

10. The registration day for graduate students each semester is the Saturday following the registration days for undergraduates. All graduate registration must be completed within three weeks of that date.

11. Women are admitted as graduate students on the same terms as men except that registration in courses open to undergraduates is subject to the special approval of the head of the department concerned.

When all requirements have been met, the candidate is recommended by the faculty to the trustees for the master's degree appropriate to the work pursued.

ENTRANCE REQUIREMENTS IN DETAIL

ENGLISH

Preparation in English has three main objects: (1) command of correct and clear English, spoken and written; (2) ability to use the vernacular with accuracy and appreciation; and (3) some acquaintance with the simpler English classics.

ENGLISH GRAMMAR AND COMPOSITION. The first two objects require instruction in grammar and composition. English grammar should be reviewed in the secondary school, and correct spelling and grammatical accuracy should be rigorously exacted in connection with all written work during the four years. The principles of English composition governing punctuation, the use of words, paragraphs, and the different kinds of composition, including letter-writing, should be thoroughly mastered; and practice in composition, oral as well as written, should extend throughout the secondary school period. Written exercises may well comprise narration, description, and easy exposition based upon the principles of elementary rhetoric, as given in any approved high school rhetoric. It is advisable that subjects for this work be taken from the student's personal experience, general knowledge, and studies other than English, as well as from his reading in literature.

LITERATURE. The third object is sought by means of two lists of books, headed respectively reading and study, from which may be framed a progressive course in literature covering four years. In connection with both lists, the student should be trained in reading aloud and be encouraged to commit to memory some of the more notable passages both in verse and in prose. The books for reading and study are to be selected from the group suggested by the Conference on Uniform Entrance Requirements in English. 3 or 4 units

HISTORY

The requirement in history is based on the recommendation of the Committee of Seven of the American Historical Association.

ANCIENT HISTORY, with special reference to Greek and Roman History, including also a short introductory study of the more ancient nations, and the chief events of the early Middle Ages down to the death of Charlemagne (814). 1 unit

MEDIAEVAL AND MODERN HISTORY, from the death of Charlemagne to the present time. 1 unit

ENGLISH HISTORY, with due reference to social and political development. 1 unit

AMERICAN HISTORY AND CIVIL GOVERNMENT, with due reference to social and political development. 1 unit

The examinations in history are so framed as to require comparison and the use of judgment on the pupil's part rather than the mere use of memory. The examinations presuppose the use of good text-books, collateral reading, and practice in written work. Geographical knowledge is tested by requiring the location of places and movements on an outline map.

MATHEMATICS

ELEMENTARY ALGEBRA (ALGEBRA TO QUADRATIC EQUATIONS). The four fundamental operations for rational algebraic expressions; factoring, determination of highest common factor and lowest common multiple by factoring; fractions, including complex fractions, and ratio and proportion; linear equations, both numerical and literal, containing one or more unknown numbers; problems depending on linear equations; radicals, including the extraction of the square root of polynomials and of numbers; exponents, including the fractional and negative. 1 unit

INTERMEDIATE ALGEBRA (QUADRATIC EQUATIONS AND BEYOND). Quadratic equations, both numerical and literal; simple cases of equations with one or more unknown numbers that can be solved by the methods of linear or quadratic equations; problems depending on quadratic equations; the binomial theorem for positive integral exponents; the formulas for the n th term and the sum of the terms of arithmetic and geometric progressions with applications. $\frac{1}{2}$ unit

ADVANCED ALGEBRA. Permutations and combinations, limited to simple cases; complex numbers, with graphical representation of sums and differences; determinants, chiefly of the second, third, and fourth orders, including the use of minors and the solution of linear equations; numerical equations of higher degree, and as much of the theory of equations, with graphical methods, as is necessary for their treatment, including Descartes' rule of sign and Horner's method, but not Sturm's functions or multiple roots. $\frac{1}{2}$ unit

PLANE GEOMETRY. The usual theorems and constructions of good text-books, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas; regular polygons; and the measurement of the circle. The solution of numerous original exercises, including locus problems; applications to the mensuration of lines and of plane surfaces. 1 unit

SOLID GEOMETRY. The usual theorems and constructions of good text-books, including the relations of planes and lines in space; the properties and measurements of prisms, pyramids, cylinders, and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including locus problems; applications to the mensuration of surfaces and solids. ½ unit

PLANE TRIGONOMETRY. Definitions and relations of the six trigonometric functions as ratios; circular measurements of angles; proofs of principal formulas, in particular for the sine, cosine, and tangent of the sum and the difference of two angles, of the double angle, and the half angle, the product expressions for the sum or the difference of two sines or of two cosines, etc.; the transformation of trigonometric expressions by means of these formulas; solution of trigonometric equations of a simple character; theory and use of logarithms (without the introduction of work involving infinite series); the solution of right and oblique triangles and practical applications. Candidates must bring their logarithmic tables to the examination. ½ unit

Candidates must have a knowledge of the metric system and be prepared to solve problems in either algebra or geometry involving the use of the metric system.

The entrance requirements in Solid Geometry and Plane Trigonometry are included in Math. 1 and Math. 16 offered during the summer session.

GREEK

GREEK. Grammar; elementary prose composition, consisting principally of detached sentences to test the candidate's knowledge of grammatical construction; Xenophon: the first four books of the *Anabasis*; the translation, at sight, of a passage from some work of Xenophon. 2 units

GREEK. Homer's *Iliad*, I-III: The first three books of the *Iliad* (omitting II, 494-end), and the Homeric forms, constructions, and prosody. 1 unit

LATIN

The requirements in Latin are in accord with those of the College Entrance Examination Board.

The Latin reading shall not be less in amount than four books of Cæsar, six orations of Cicero, and six books of Vergil's Aeneid for the second, third, and fourth years respectively. There are no prescribed readings, but the following recommendations are made:

(1) In the second year the early reading should be easy Latin which may be "made" or adapted Latin; not less than one semester of this year should be devoted to the reading of selections from Caesar. The reading for this year may also include easy selections from such authors as Aulus Gellius, Eutropius, Nepos, Phaedrus, Quintus Curtius Rufus, and Valerius Maximus, or books of selections containing some of these together with other authors of prose works.

(2) In the third year, if the reading be in prose, not less than one semester should be devoted to the reading of selections from Cicero; the reading for the year may also include selections from such authors as Pliny, Sallust, and Livy, or books and selections containing these and other authors of prose works.

(3) In the fourth year, if the reading be in poetry, not less than one semester should be devoted to the reading of selections from Vergil; and the reading for the year may also include selections from such works as the Metamorphoses, Tristia, Heroines, and Fasti of Ovid, or books of selections containing poems or extracts from Ovid or from other poets.

The College Entrance Examination Board has prepared a word list which includes a vocabulary that students are expected to have at the end of two years, three years, and four years of Latin study. The list will serve to reassure teachers that deviation from the beaten path is safe provided they take the required vocabulary as one of their guides in making their choice of selections from the works recommended above. This word list may be obtained from the College Entrance Examination Board, 431 West 117th Street, New York, N. Y.

GERMAN

ELEMENTARY GERMAN, A. This requirement follows, in the main, the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) careful drill in pronunciation; (2) the memorizing and frequent repetition of easy colloquial sentences; (3) drill in the rudiments of grammar, that is, upon the inflection of the articles, of such nouns as belong to the language of everyday life, of adjectives, pronouns, weak verbs, and the more usual strong verbs; also upon the use of the more common prepositions, the simpler use of the modal auxiliaries, and the elementary rules

of syntax and word-order; (4) abundant easy exercises, designed not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression; (5) reading of from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lesson (the teacher giving the English), and in the reproduction from memory of sentences previously read.

During the second year the work should comprise: (1) the reading of from 150 to 200 pages of literature in the form of easy stories and plays; (2) accompanying practice, as before, in the translation into German of easy variations upon the matter read and in the off-hand reproduction, sometimes orally and sometimes in writing, of the substance of short and easy selected passages; (3) continued drill in the rudiments of the grammar, directed to the ends of enabling the pupil, first, to use his knowledge with facility in the formation of sentences, and, secondly, to state his knowledge correctly in the technical language of grammar.

2 units

INTERMEDIATE GERMAN, B. This work should comprise, in addition to the elementary course, the reading of about 400 pages of moderately difficult prose and poetry, with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tenses and modes (with special reference to the infinitive and subjunctive), and likewise upon word order and word formation.

1 unit

FRENCH

ELEMENTARY FRENCH, A. This requirement follows in the main the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) careful drill in pronunciation; (2) the rudiments of grammar, including the inflection of the regular and the more common irregular verbs, the plural of nouns, the inflections of adjectives, participles, and pronouns; the use of personal pronouns, common adverbs, prepositions, and conjunctions; the order of words in the sentence and the elementary rules of syntax; (3) abundant easy exercises, designed not only to fix in the memory the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression; (4) the reading of from 100 to 175 pages of standard texts with constant practice in translating into French easy variations upon the sentences read (the teacher giving the

English), and in reproducing from memory sentences previously read; (5) writing French from dictation.

During the second year the work should comprise: (1) the reading of from 250 to 400 pages of easy modern prose in the form of stories, plays, or historical or biographical sketches; (2) constant practice, as in the previous year, in translating into French easy variations upon the texts read; (3) frequent abstracts, sometimes oral and sometimes written, of portions of the texts already read; (4) writing French from dictation; (5) continued drill upon the rudiments of grammar, with constant application in the construction of sentences; (6) mastery of the forms and uses of pronouns and pronominal adjectives, of all but the rare irregular verb forms, and of the simpler uses of the conditional and subjunctive. 2 units

INTERMEDIATE FRENCH, B. This should comprise the reading of from 400 to 600 pages of French of ordinary difficulty, a portion to be in the dramatic form; constant practice in giving French paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; the study of a grammar of moderate completeness; writing from dictation. 1 unit

SPANISH

ELEMENTARY SPANISH, A. Two years' preparation, covering the following ground:

During the first year: (1) drill in the correct production of Spanish sounds; (2) the rudiments of grammar, illustrated by abundant easy exercises; (3) the reading of about 150 pages of graduated text with constant translating into Spanish of easy variations of sentences read, the teacher giving the English; (4) aural drill: practice in translating into English Spanish words, clauses, and sentences heard but not seen, the teacher giving the Spanish.

During the second year: (1) reading of 250 to 400 pages of easy modern prose; (2) constant practice in translating into Spanish easy variations upon the text read; (3) aural practice and drill in pronunciation; (4) mastery of the forms and uses of pronouns, of the subjunctive mode, and of the forms of the radical changing verbs. 2 units

INTERMEDIATE SPANISH, B. The reading of not less than 500 additional pages of Spanish prose together with the translation of at least 40 pages of simple connected English prose into Spanish. 1 unit

PHYSICS

The course of instruction in physics should include:

(1) The study of some standard text-book, for the purpose of obtaining a connected view of the subject; (2) instruction by lecture table demonstrations, to be used mainly for illustration

of the facts and phenomena of physics; (3) individual laboratory work consisting of at least thirty experiments designed to supplement the pupil's fund of concrete knowledge and chosen with a view to furnishing forceful illustration of fundamental principles and their practical application. 1 unit

CHEMISTRY

The requirement in chemistry is based on the report of the Committee on Chemistry of the Science Department of the National Education Association.

ELEMENTARY CHEMISTRY. It is recommended that the candidate's preparation in chemistry include: (1) individual laboratory work, comprising at least forty exercises; (2) instruction by lecture table demonstrations, to be used mainly as a basis for questioning upon the general principles involved in the pupil's laboratory investigations; (3) the study of at least one standard text-book, to the end that the pupil may gain a comprehensive and connected view of the most important facts and laws of elementary chemistry. 1 unit

Students properly qualified are examined in Elementary Chemistry during freshman week; those passing the examination may omit Elementary Chemistry, Chem. 1 and 11, and take instead Chem. 3 and 13 during the first semester.

BIOLOGY

BIOLOGY. A year's work in general biology. 1 unit

In order to be acceptable in satisfaction of the distribution requirement in biology in the College of Arts and Science, the course offered may not be botany, zoology, or physiology but must be a general course covering such topics as are enumerated in the description of Biol. 1 in this Register. Whether the course offered is acceptable will be determined at the University.

ZOOLOGY

ZOOLOGY. The equivalent of Jordan, Kellogg, and Heath's *Animal Studies*, with laboratory work. $\frac{1}{2}$ or 1 unit

BOTANY

BOTANY. An amount equal to that contained in Bergen's *Foundations of Botany*, with laboratory work. $\frac{1}{2}$ or 1 unit

PHYSIOLOGY AND HYGIENE

PHYSIOLOGY AND HYGIENE. A course covering approximately what is given in such a text-book as Huxley and Youman's *Physiology and Hygiene*. $\frac{1}{2}$ or 1 unit

PHYSIOGRAPHY

PHYSIOGRAPHY. The study of a standard text-book in physical geography. Individual laboratory work, comprising at least forty exercises, with notebook, is recommended.

$\frac{1}{2}$ or 1 unit

DRAWING

FREEHAND DRAWING. Sketching of simple geometrical figures, of objects, and from copy. At least twenty plates must be submitted.

$\frac{1}{2}$ unit

MECHANICAL DRAWING. The use of instruments and the preparation of at least twenty plates, illustrating the elements of descriptive geometry or simple machine parts.

$\frac{1}{2}$ unit

MANUAL TRAINING

MANUAL TRAINING. Shop work in wood or metal in schools giving courses in manual training.

$\frac{1}{2}$ or 1 unit

BOOKKEEPING, TYPEWRITING, AND STENOGRAPHY

BOOKKEEPING, TYPEWRITING, AND STENOGRAPHY, covering a formal course of study in school.

1 or 2 units

TUITION AND OTHER FEES

Tuition, in all colleges of the University, per annum....	\$400.00
Health Service fee, per annum.....	12.00
Athletic fee, per annum.....	15.00
Library fee†	5.00
Student Activities fee.....	5.00
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Total annual fees.....	\$437.00

These fees are payable as follows:

FIRST SEMESTER

(Payable on the registration days in September)

Tuition fee	\$225.00
Athletic fee, in full.....	15.00
One-half of the annual Health Service fee.....	6.00
One-half of the annual Student Activities fee.....	2.50
One-half of the annual Library fee.....	2.50
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Total fees, first semester..... \$251.00

SECOND SEMESTER*

(Payable on the registration days in February)

Tuition fee	\$175.00
One-half of the annual Health Service fee.....	6.00
One-half of the annual Student Activities fee.....	2.50
One-half of the annual Library fee.....	2.50
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Total fees, second semester..... \$186.00

MATRICULATION AND GRADUATION FEES. New students pay, once only, on admission, a matriculation fee of \$5.00; students at graduation pay a graduation fee of \$10.00.

LABORATORY FEES AND DEPOSITS. There are also laboratory fees or deposits in laboratory courses to cover the cost of laboratory supplies used by the individual students and to pro-

* Students entering or re-entering in the second semester pay first semester fees, except that they pay only one-half the athletic fee, \$7.50.

† Not charged in the case of students registered for fewer than seven semester hours.

vide for breakage of glassware and instruments; the amounts of these fees and deposits are given in the description of courses in connection with each laboratory course. A deposit of \$25.00 is made by each student taking courses in Military Science and Tactics; this deposit is refunded when the government property issued to the student is returned.

LATE REGISTRATION FEES. The penalty for late registration is \$1.00 a day, up to a maximum of \$5.00, for each day of delay beyond the registration days in taking out the registration ticket; and a registration not completed within three days after the date on the registration ticket is subject to a late registration fee of \$1.00 a day up to a maximum of \$5.00.

SUMMER SESSION TUITION. The tuition for courses taken in the summer session is at the rate of \$10.00 a credit hour.

SPECIAL EXAMINATION FEES. Special examinations, authorized by the Committee on Standing of Students, are subject to a fee of \$5.00 each. This regulation applies to the psychological examination required of new students, if taken at other than the scheduled date. Any student who fails to keep his appointment for his physical examination is charged a late examination fee at the rate of \$1.00 a day until he applies for and receives another appointment; if he fails to meet his second appointment or any succeeding appointments, he again becomes subject to the same fee at the same rate.

REFUNDS. A refund of one-half of the tuition and laboratory fees of the current semester, one-half of the athletic fee and of the student activities fee, and the unused balance of chemistry deposits, is made to students who formally withdraw from the University within four weeks after the beginning of the semester; a refund of three-fourths of the tuition and laboratory fees, one-half of the athletic fee and of the student activities fee, and the unused balance of chemistry deposits is made to students who formally withdraw within two weeks; a refund of the entire tuition and laboratory fees, the entire athletic fee and the student activities fee, and the unused

balance of chemistry deposits is made to students who formally withdraw within one week. The matriculation fee, the health service fee, and the library fee are not refunded. If a student is obliged to withdraw through injury or other physical disability and is unable to return later in that semester, a pro-rata credit is allowed toward the tuition of the corresponding semester a year later.

EXEMPTIONS. Students registered for fewer than seven semester hours are exempted from the library and health service fees. The payment of the athletic fee and the students' activities fee is optional for graduate students and also for undergraduates who are registered for fewer than seven semester hours.

SPECIAL SCHEDULES. Tuition for special schedules of less than twelve hours in any semester is at the rate of \$12.50 a semester hour.

STUDENT ACTIVITIES FEE. The student activities fee is appropriated as follows: Lehigh *Brown and White*, \$1.75; Lehigh Union, \$0.75; Arcadia, \$0.50; Class dues, \$1.00; Mustard and Cheese, \$0.50; Musical Clubs, \$0.50.

GRADUATE STUDENTS TUITION. The tuition for graduate courses is at the rate of \$10.00 a semester hour. Graduate students pay the matriculation fee, and the library and health service fees if their schedules are seven or more semester hours; they are given the option of paying or not paying the athletic and student activities fees; if they pay these fees they obtain the corresponding benefits.

To be eligible for a degree from Lehigh University, a student not only must have completed all of the scholastic requirements for the degree, but must have paid all University fees and all bills for the rental of rooms in the dormitories, or for damage to University property or equipment, or for any other indebtedness to the University; this regulation, however, does not apply to any indebtedness for deferred tuition or for loans from trust funds administered by the University, which are protected by properly executed notes approved by the Comptroller.

EXPENSES

Necessary expenses for the collegiate year, clothing and traveling not included, are estimated at \$500.00 in addition to tuition.

The University dormitories accommodate 171 students. The charge for single rooms is \$50.00, \$65.00, or \$80.00 a year; suites of three or four rooms rent at \$100.00 or \$120.00 for each occupant. Applications for rooms in the University dormitories should be filed with the Bursar.

A cafeteria is located in Drown Memorial Hall. Numerous private householders in the city offer rooms and board at moderate prices; information concerning such rooms and board may be obtained from the Registrar.

Books, stationery, and drawing instruments may be purchased at the Supply Bureau in the Alumni Memorial Building.

THE COLLEGE OF ARTS AND SCIENCE

The curriculum of the College of Arts and Science is based upon the general principles of distribution and concentration. The object of the distribution requirements is to give the student an elementary knowledge of the fields of contemporary thought and to orient him in the world of man and nature. These requirements are coordinated so far as possible with the work of the preparatory schools, and the number and nature of the prescribed courses to be taken in college is dependent upon the subjects presented for entrance.

The number of elective courses depends on the individual's distribution requirements but the work is so arranged that at least one free elective is open to every freshman. Well prepared freshmen have greater freedom in the choice of electives. In the succeeding years, the number of free electives increases, being limited solely by the demands of the major work and the number of courses allowed the student per semester. Electives in the freshman and sophomore years should be used as orientation courses, for the purpose of enabling the student to discover his major interests. In the last two years the selection of electives is determined by the personal choice of the individual student. The concentration or major requirement enables the student to capitalize his interests and to acquire a thorough grounding in some particular field.

The minimum course of study comprises fifteen scholastic hours or periods weekly. Students of proved ability, however, are not limited to this minimum.

The degree of Bachelor of Arts is conferred upon graduates of the College of Arts and Science.

Requirements for Graduation

1. The completion of one hundred twenty credit hours of collegiate work, apportioned so as to cover the distribution and concentration requirements, in addition to Military Science and Tactics, Moral and Religious Philosophy, and Physical Education required of all students.
2. A comprehensive examination in the major field with a grade of not less than C.

Distribution Requirements

1. **ENGLISH.** Twelve semester hours. These are ordinarily Engl. 1, 2, 4, and 5. Students who demonstrate satisfactory ability in written composition in their placement examinations may satisfy this English requirement by passing Engl. 4 and 5 or an equivalent.

2. **FOREIGN LANGUAGE.** A reading knowledge of Latin, Greek, French, or German and an elementary knowledge of a second of these languages are required of all students. The requirement takes into consideration work done in the preparatory schools and may be met in the following ways:

Reading knowledge. Students may satisfy this requirement by examination; otherwise, students who offer three or four years of Latin, French, Greek, or German at entrance satisfy this requirement by passing Lat. 1, 2, Gk. 5, 6, Fr. 21, 22, or Ger. 9, 10, in course; those who offer only two years of Latin, Greek, French, or German continue the language presented for two years. With the permission of the Director of the College such students may substitute one of the other three languages. Students who offer two years of two or more languages, Latin, Greek, French, or German, may choose from these the language they are to continue. Students who offer two or more years in Spanish only take Latin, Greek, French, or German in college for two years in addition to the elementary requirement stated below.

Elementary knowledge. The elementary knowledge may be established by examination at entrance or later or by passing Lat. 31, 32, Gk. 1, 2, Fr. 1, 2, or Ger. 1, 2, or any higher course in these languages.

3. **BIOLOGY, CHEMISTRY, GEOLOGY, PHILOSOPHY, PHYSICS, AND PSYCHOLOGY.** Three semester hours each. If a student has received entrance credit for one year's work in any of these subjects, he may omit that subject from his requirement. This requirement may be met by taking specially designed introductory courses in these subjects.

4. **MATHEMATICS AND ASTRONOMY.** Including the preparatory mathematics each student must present for graduation Elementary Algebra, Intermediate Algebra, Plane Geometry, Plane

Trigonometry, and either Advanced Algebra or Solid Geometry or Astronomy. Unified Mathematics pursued in college may be substituted semester by semester for any of the last four subjects.

5. HISTORY. Nine semester hours. For each year of history for which a student receives entrance credit this distribution requirement is reduced three hours. Students who have had no course in ancient history at entrance are required to take at least three semester hours in ancient history in college.

6. ECONOMICS. Six semester hours in economics are required of all students who have not had at least one full year of economics in the preparatory school.

Distribution requirements except economics should be met during the freshman and sophomore years. The assignment of the courses covering the distribution requirement of the individual student is made by the Director of the College.

Concentration Requirements—Majors

During the second semester of the freshman year each student must select some sequence of studies as his major field. A major consists of at least twelve semester hours of advanced work in the field chosen. Including preliminary college work, the minimum number of hours constituting a major is twenty-four. Change of major is permitted up to the end of the sophomore year. Majors must be approved by the professors concerned and the Director of the College.

The major work is designed to enable a student to master his chosen field so far as that is possible in the two years devoted to the subject. In all fields certain courses are prescribed but the mere passing of courses will not satisfy the major requirement. It is expected that the student will read widely in his subject and prepare himself largely through his own reading and his own independent work for his final comprehensive examinations. After a student has selected a major subject, the head of the department in which the major is selected becomes the official adviser of the student and guides him in his choice of electives. The Director of the College of Arts and Science may be consulted at any time concerning the major requirements. Details concerning the major requirements are to be found in the printed Major Pamphlet.

A comprehensive examination in the major subject is required of all students. This examination is given at the end of the senior year and may be oral or written or both. The comprehensive examinations are given under the direction of the head of the major department; at least two university teachers and, whenever possible, representatives of at least two departments take part in the examinations.

On the advice of the head of the department in which the major work is being done and with the consent of the Director of the College, a senior of unusual merit who wishes to concentrate in his chosen field may be allowed to substitute not more than six hours of unscheduled work per semester for six hours of elective work otherwise required for graduation.

Special Honors (Honors in Majors)

Special honors are awarded at the end of the senior year, on recommendation of the head of the department concerned and by vote of the faculty, to students who have done advanced work of unusual merit in some chosen field. Candidates for special honors must indicate during the first semester of the junior year their intention to work for such honors. Awards are based on grades obtained in the subject chosen, the results in extra work assigned, and the general proficiency of the candidate as evidenced by either a final examination or a thesis, as the head of the department involved may direct.

Special Regulations for English

Students in the College of Arts and Science who persistently use poor English may be reported at any time to the Director of the College. He may require that they take additional English without credit toward graduation. Toward the end of the junior year each junior in the College of Arts and Science must report to the department of English for an exercise in impromptu writing. Students found seriously deficient in this test are reported to the Director of the College, who may require that they take additional English without credit toward graduation.

Elective Studies

1. Courses open to freshmen as electives.

FIRST SEMESTER			FRESHMAN ELECTIVES			SECOND SEMESTER		
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Biol. 1	Biology	3	Astr. 1	Descriptive Astr.	3			
Bus. 1	Ind. Evolution	3	Biol. 2	Mam. Anatomy	2			
Chem. 1	Elem. Chemistry	2	Biol. 3	Comp. Anatomy	3			
Chem. 3	Inter. Chemistry	2	Biol. 6	Botany	3			
Chem. 11	Chemistry Lab.	2	Biol. 9	Genetics	1			
Chem. 12	Chemistry Lab.	1	Bus. 2	Ind. Evolution	3			
Chem. 13	Chemistry Lab.	2	Chem. 1	Elem. Chemistry	2			
Chem. 14	Chemistry Lab.	1	Chem. 8	Stoichiometry	1			
Engl. 3a	World Literature	3	Chem. 11	Chemistry Lab.	2			
Engl. 4	Drama	3	Chem. 20	Qual. Analysis	3			
Engl. 10	Public Speaking	3	Engl. 3b	World Literature	3			
F.A. 5	Freehand Draw.	3	Engl. 5	Drama	3			
Fr. 1	Elem. French	3	Engl. 11	Public Speaking	3			
Fr. 11	Inter. French	3	F.A. 6	Freehand Draw.	3			
Fr. 21	Adv. French	3	Fr. 1	Elem. French	3			
Geol. 3, 6	Intro. to Geology	3	Fr. 2	Elem. French	3			
Ger. 1	Elem. German	3	Fr. 12	Inter. French	3			
Ger. 3	Inter. German	3	Fr. 22	Adv. French	3			
Ger. 9	Adv. German	3	Geol. 4, 6	Gen. Geology	3			
Gk. 1	Elem. Greek	3	Geol. 8	Historical Geol.	3			
Gk. 3	Inter. Greek	3	Ger. 1	Elem. German	3			
Gk. 5	Adv. Greek	3	Ger. 2	Elem. German	3			
Hist. 13	U.S. History	3	Ger. 4	Inter. German	3			
Hist. 25	European History	3	Ger. 10	Faust	3			
Ital. 1	Elem. Italian	3	Gk. 2	Elem. Greek	3			
Lat. 1a	Pliny, Cicero	3	Gk. 4	Inter. Greek	3			
Lat. 1b	Vergil, Ovid	3	Gk. 6	Adv. Greek	3			
Lat. 21	Ancient History	3	Hist. 14	U.S. History	3			
Lat. 31	Elem. Latin	3	Hist. 26	European History	3			
Lat. 33	Inter. Latin	3	Ital. 2	Elem. Italian	3			
Math. 1	Plane Trig.	3	Lat. 2	Horace	3			
Math. 1a	Unified Math.	3	Lat. 22	Ancient History	3			
Math. 16	Solid Geometry	3	Lat. 32	Cæsar	3			
Math. 2	Algebra	3	Lat. 34	Cicero	3			
M.R. Ph. 11	M.&R. Philosophy	1	Math. 1	Plane Trig.	3			
M.R. Ph. 13	Ethics: Problems	1	Math. 2	Algebra	3			
Phil. 3	Intro. Philosophy	3	Math. 2a	Unified Math.	3			
Phys. 12	Intro. to Physics	3	Math. 3	Anal. Geometry	3			
Psych. 1	Elem. Psychology	3	Math. 16	Solid Geometry	3			
Span. 1	Elem. Spanish	3	M.R. Ph. 12	Phil. of Conduct	1			
Span. 11	Inter. Spanish	3	M.R. Ph. 16	Phil. of Religion	1			
Span. 21	Adv. Spanish	3	Phil. 3	Intro. Philosophy	3			
			Phys. 13	General Physics	3			
			Psych. 1	Elem. Psychology	3			
			Span. 2	Elem. Spanish	3			
			Span. 12	Inter. Spanish	3			
			Span. 22	Adv. Spanish	3			

2. Sophomores, juniors, and seniors may elect in general any courses for which they have the prerequisites. Elementary courses intended primarily for freshmen and sophomores may not be taken for graduation credit by juniors and seniors without the consent of the Director of the College and the student's major adviser.

3. Advanced courses in Military Science and Tactics are optional with other courses and must be approved by the Director of the College.

Preparation for Professional Schools and the Professions

While the College of Arts and Science is primarily nonvocational in its objective, it does provide the preliminary training necessary for admission to the various graduate schools and, in some cases, notably in teaching and journalism, prepares directly for a profession. Since a large proportion of the graduates of the College of Arts and Science of Lehigh University continue their work in graduate schools the College offers a number of course combinations designed to give intensive preliminary training for the various fields of medicine, law, theology, engineering, business administration, etc. Students who are looking forward toward any one of the graduate schools should consult the director of the College who will assist them to plan their courses. Illustrative combinations are listed below:

Preparation for Medicine and Dentistry

Students in the College of Arts and Science who are preparing to enter a medical school must meet the regular requirements for distribution and concentration. During the four years they must elect the following courses prescribed by the college to meet the demands of the medical schools.

In Biology:

- Biol. 1 General Biology
- Biol. 2 Mammalian Anatomy
- Biol. 3 Comparative Anatomy
- Biol. 4 Vertebrate Embryology
- Biol. 9 Genetics
- Biol. 54 Bacteriology

In Chemistry:

- Chem. 1 and 11 Elementary Chemistry and Laboratory, or
- Chem. 3 and 13 Intermediate Chemistry and Laboratory
- Chem. 6 Advanced Chemistry
- Chem. 8 and 20 Stoichiometry and Qualitative Analysis
- Chem. 30 and 41 Quantitative Analysis
- Chem. 160, 161, 165, 166 Organic Chemistry

In Physics:

Phys. 12 Introduction to Physics
Phys. 13 and 14 General Physics

Students preparing for medicine should major in biology or chemistry. The professor of Biology is the official adviser of students preparing for medicine.

Students looking forward to dentistry are advised to complete the four year college course. The work prescribed is the same as for medicine. For students who are unable to spend four years in preparation special programs covering two or three years will be arranged.

Preparation for Law School

In general the law schools do not specify any particular preparation beyond that required for a B.A. or B.S. degree. The prospective law student must meet the distribution and concentration requirements of the college. He should major in the field which most interests him but should at all events elect courses in English, History, Government, Economics, and Psychology. Latin is not essential but is strongly recommended. At least one course in Accounting should be elected by students who are planning to enter corporation law as a profession.

Preparation for Teaching

Students who expect to teach upon graduation should consult with the department of Education early in their college course. A license or certificate is required of every one who teaches in the public schools of Pennsylvania or of any other state. The approved certificate in Pennsylvania for college graduates is the College Provisional Certificate granted upon completion of twenty-one (including Elementary Psychology) semester hours of professional or pedagogical courses and a minimum of eighteen semester hours in each subject which the candidate expects to teach. The twenty-one semester hours of professional studies are apportioned as follows:

Psych. 1 Elementary Psychology (3)
Educ. 1 Introduction to Teaching (3)
Educ. 20 Educational Psychology (3)
Educ. 53 and 54 Practice Teaching (6)

Educ. 51, 119, 120, 130, 131, 150, 171 Elective studies (6) and special method courses.

The requirements for certification in other states are similar to those in Pennsylvania, with minor differences.

A student who is preparing to teach should major in the subject he prefers to teach or in Education. Special method courses may be taken in the several departments that deal with the subject matter of school instruction: language, science, etc. Practice teaching is done mainly in the Bethlehem High Schools; but observation, practice, and substitute teaching may be done in elementary schools in Bethlehem and elsewhere. The department of Physical Education offers courses for students who anticipate coaching and supervision of physical education.

Preparation for Journalism

Students who plan to enter the field of Journalism directly or through the medium of the graduate school should choose for their field of concentration the major in Journalism offered by the College of Arts and Science. The major consists of the following courses:

Engl. 43	Reporting and Writing
Engl. 44	Advanced Reporting
Engl. 46	Editing and Copy Reading
Engl. 50	Editorial Writing
Engl. 51	Newspaper Problems
Engl. 54	Journalism Seminar
Engl. 71-78	<i>Brown and White</i> —at least four semesters

Other requirements include twelve hours of English literature and courses in European History, Government, Psychology, Economics and Sociology.

Preparation for Engineering

If a student in the College of Arts and Science contemplates becoming a candidate for a degree in engineering after the completion of his B.A. curriculum, he should major in Mathematics, Business, Physics, or Chemistry, and choose as electives such technical studies as are contained in the earlier years of the engineering curriculum which he wishes to complete. By carefully selecting electives, with the advice and

guidance of the director of his curriculum and the professor in charge of the engineering curriculum concerned, the graduate of the B.A. curriculum may enter the engineering curriculum chosen in full standing, and obtain his engineering degree in one or two years of further study. A detailed plan is made for each student.

Preparation for Business Administration

Students who are looking forward to further work in an undergraduate or graduate school of Business Administration or students who plan to enter business directly upon completion of their Arts course should major in the field of their special interests but should elect at least three one-year courses in Economics or Business Administration beyond the introductory Economics. They may, of course, major in Business Administration, but this is not advised unless the student expects to enter business immediately after graduation.

THE COLLEGE OF BUSINESS ADMINISTRATION

The purpose of the College of Business Administration is to provide for students intending to enter business rather than the professions thorough training in the principles which underlie all business activity. With this end in view the College offers a four-year curriculum which covers the fundamental economic principles that control the operation of industrial and commercial enterprises, the general laws that determine economic progress, and the basic facts of accounting, finance, and statistics that are applicable to all business.

The College of Business Administration does not pretend to equip students for the management of enterprises or the holding of responsible business positions immediately after graduation. It makes no attempt to provide a substitute for the training and experience in the complex details of any particular business that can be gained only from actual contact with that business. The primary aim is to develop in the student an intelligent understanding of forces and principles, an ability to analyze industrial and commercial phenomena, and a habit of thought that will enable him in later life to cope with the problems which increasing executive responsibility will bring. Above all, the curriculum is intended to give the student such familiarity with various types of business that he can intelligently choose the special branch in which he is most likely to succeed.

In accordance with this plan of training in fundamentals the curriculum in Business Administration is more rigidly outlined than the ordinary curriculum of this type, with less opportunity than is customary for a narrow specialization in a technical field. The student who is especially interested in some such type of work as accounting or finance or industrial administration is given an opportunity to specialize in that field, but the curriculum does not permit specialization at the expense of the work in the fundamentals of industrial history, economic development, and social problems. The freshman year is devoted to work of a general nature which

provides a scientific and literary background for the later work. In the sophomore year the student takes up the basic courses which are prerequisite to the advanced work in business practice. The junior and senior years are devoted chiefly to technical business courses, so arranged that the student must learn the fundamentals common to all business enterprise.

Advanced courses in Military Science and Tactics are optional with other courses and must be approved by the Director of the College.

Graduates of this curriculum receive the degree of Bachelor of Science in Business Administration.

THE CURRICULUM IN BUSINESS ADMINISTRATION

FIRST SEMESTER			FRESHMAN YEAR			SECOND SEMESTER		
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 1	Ind. Evolution	3	Bus. 2	Ind. Evolution	3			
Engl. 1	English	3	Engl. 2	English	3			
Math. 1	Trigonometry	3	Math. 2	Algebra	3			
Math. 2	or Algebra	3	Math. 3	or Anal. Geom.	3			
Fr. 1 or 11.	French	3	Astr. 1	or Des. Astr.	3			
Ger. 1 or 3.	or German	3	Math. 16	or Sol. Geom.	3			
Span. 1 or 11.	or Spanish	3	Fr. 2 or 12.	French	3			
Chem. 1 or 3.	Chemistry	2	Ger. 2 or 4.	or German	3			
Chem. 12 or 14.	& Chem. Lab. 1	—	Span. 2 or 12.	or Spanish	—			
Biol. 7	or Biology	3	Chem. 21	Qual. Anal.	2			
Geol. 16	or Physiog.	3	Chem. 8	& Stoichi.	1			
Phys. 12	or Physics	3	Biol. 8	or Biology	3			
Mil. 1	M. S. & T.	2	Geol. 17	or Physiog.	3			
P.E. 1	Physical Ed.	—	Phys. 13	or Physics	—			
M.R. Phil. ...Chapel 1	—	—	Mil. 2	M. S. & T.	2			
M.R. Phil. 11. or M.R. Phil. 11.	—	—	P.E. 2	Physical Ed.	—			
M.R. Phil. 13. or Phil. Con.1	—	—	M.R. Phil. ...Chapel 2	—	—			
		—	M.R. Phil. 12. or Phil. Con.1	—	—			
		—	M.R. Phil. 16. or Phil. Rel. 1	—	—			

17

17

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3			
Bus. 11	Accounting	3	Bus. 12	Accounting	3			
Hist. 13	U. S. History	3	Hist. 14	U. S. History	3			
Hist. 25	or Eurpn. Hist.	3	Hist. 26	or Eurpn. Hist.	3			
Hist. 27	or Eurpn. Exp.	3	Hist. 28	or Eurpn. Exp.	3			
Psych. 1	Psychology	3	Psych. 15	Ap. Psychology	3			
Fr. 11 or 21.	French	3	Fr. 12 or 22.	French	3			
Ger. 3 or 9.	or German	3	Ger. 4 or 10.	or German	3			
Span. 11 or 21	or Spanish	3	Span. 12 or 22	or Spanish	3			
Engl. 4, 6, or 10	or English	3	Engl. 5, 7, or 11	or English	3			
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2			
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—			
*M.R. Phil. ...Chapel 3	—	—	*M.R. Phil. ...Chapel 4	—	—			

17

17

* Taken by students who elect Chapel 1 and 2 during freshman year.

FIRST SEMESTER	JUNIOR	YEAR	SECOND SEMESTER
Bus. 21 Corp. Finance . . .	3	Bus. 22 Corp. Finance . . .	3
Bus. 29 Money & Banking . . .	3	Bus. 30 Money & Banking . . .	3
Bus. 45 Statistics	3	Bus. 46 Business Cycles . . .	3
Bus. 15 Cost Accounting	3	Bus. 16 Accounting Sys. . . .	3
Bus. 49 or Econ. Geog.	3	Bus. 50 or Econ. Geog.	3
Math. 41 or Math. of Fin.		Math. 42 or Math. of Stat. . . .	3
Govt. 51 American Govt.		Govt. 52 American Govt. . . .	3
Govt. 157 or Mun. Man.	3	Govt. 158 or Mun. Man.	3
Elective	3	Elective	3
P.E. 5 Physical Ed.	—	P.E. 6 Physical Ed.	—

FIRST SEMESTER	SENIOR	YEAR	SECOND SEMESTER
Any five of the following courses:			Any five of the following courses:
Bus. 33 Labor Problems.			Bus. 34 Labor Problems.
Bus. 57 Marketing			Bus. 56 Business Law
Bus. 107 Adv. Economics.			Bus. 58 Adv. & Selling. . . .
Bus. 113 Adv. Accounting			Bus. 108 Adv. Economics.
Bus. 123 Investments	15		Bus. 114 Acct. Theory
Bus. 131 Banking Policies			Bus. 126 Public Finance.
Bus. 135 Public Utilities.			Bus. 132 Money Markets.
Bus. 161 Sociology			Bus. 136 Public Utilities.
I.E. 2 Industrial Man.			Bus. 162 Sociology
Math. 43 Math. of Ins...			I.E. 3 Industrial Man.
Elective 3			Elective 3
P.E. 7 Physical Ed. . . . —			P.E. 8 Physical Ed. . . . —
	18		18

THE COLLEGE OF ENGINEERING

The College of Engineering offers courses of study in

Chemical Engineering
Chemistry
Civil Engineering
Electrical Engineering
Engineering Physics
Industrial Engineering
Mechanical Engineering
Metallurgical Engineering
Mining Engineering

The Curricula

The engineering curricula were formulated on the basis of an intensive study, by the faculty of Lehigh University, of the problems of technical education and the changing needs of modern industry. This study led to the conclusion that greater emphasis than heretofore should be placed upon the fundamentals of engineering, including mathematics, physics, chemistry, and theoretical and applied mechanics, and less emphasis upon the highly specialized details of engineering practice; and that the engineer must know something of the social sciences, that is, the sciences which deal with human relations, and be familiar with the methods of business organization and administration. The various engineering curricula are arranged accordingly, to increase the time devoted to fundamentals and to nontechnical subjects, which are a part of the equipment of every well educated man and which are now recognized as essential to the proper training of engineers because of their practical applications in industrial and business life.

Advanced courses in Military Science and Tactics are optional with other courses and must be approved by the curriculum head concerned.

Among the noteworthy features of the curricula the following may be mentioned:

(1) Provision is made for a uniform freshman year in the College of Engineering, so that no student is required to select his course of study until he is better prepared, after a year of college work, to choose wisely. The requirements in the sophomore year for the various curricula are similar although not entirely uniform. A student can, therefore, change from one curriculum to another at the close of the second year with little difficulty.

(2) The work of the first two years is fairly self-contained. To those who for one reason or another are unable to complete their engineering training, it affords preparation for careers as draftsmen, electricians, surveyors, shop foremen, or assistants in industrial laboratories or plants. Students who complete in full the work of the first two years and who then withdraw from the University are given a certificate of work completed.

(3) At the close of the second year a comprehensive examination is required on the work of the first two years. Students whose showing in this examination is unsatisfactory and whose work for the first two years has been poor may be advised to withdraw from the University or to change into other curricula better suited to their aptitudes and interests.

(4) Since the University recognizes that an engineer cannot be trained by purely academic process, the degree awarded upon graduation is Bachelor of Science in the particular division of engineering that has been studied, for example, B.S. in Civil Engineering. The successful completion of one year of graduate study leads to the degree of Master of Science in the particular division of engineering studied.

(5) Professional engineering degrees such as Civil Engineer (C.E.), Mechanical Engineer (M.E.), etc., are awarded to graduates of Lehigh University having the degree of Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, etc., who have had not less than five years of acceptable practical experience in responsible charge of work after graduation, and who submit a suitable thesis. A candidate who has received a master's degree from Lehigh University is eligible for the professional degree on the same basis.

Engineering Conferences

Throughout the freshman year weekly conferences are held by the directors of curricula, to which groups of students must go in turn for orientation, motivation, and vocational guidance. During the sophomore year these conferences are continued in the curriculum of the student's choice. By means of these conferences and by the appraisal made by each instructor throughout the freshman and sophomore years, an estimate of the student's aptitude for further engineering work is attempted.

The Uniform Freshman Year

An outline follows of the work of the freshman year, uniform for all engineering students. For schedules of the work of the upper three years, varying according to the several specialized curricula, see the subsequent pages.

FIRST SEMESTER		FRESHMAN YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Chem. 1 or 3.	Chemistry	2	Chem. 8	Stoichiometry	1
Chem. 11 or 13.	Chemistry Lab.	2	Chem. 20	Qual. Analysis	3
C.E. 1	Engr. Drawing	2	C.E. 2	Engr. Drawing	2
Engl. 1	English	3	Engl. 2	English	3
*Math. 2	Algebra	3	Math. 3	Analytic Geom.	3
Phys. 1	Elem. Physics	4	Math. 20	Mechanics	4
Math. 20	or Mechanics	4	Phys. 1	or Elem. Phys.	2
Mil. 1	M. S. & T.	2	Mil. 2	M. S. & T.	2
E.C. 1	Eng. Conferences	—	E.C. 2	Eng. Conferences	—
P.E. 1	Physical Ed.	—	P.E. 2	Physical Ed.	—
M.R. Phil. 1	Chapel 1	—	M.R. Phil. 12	Chapel 2	—
M.R. Phil. 11	or M.R. Phil. 1	—	M.R. Phil. 16	or Phil. Con. 1	—
M.R. Phil. 13	or Phil. Con. 1	—	M.R. Phil. 16	or Phil. Rel. 1	—

18

18

SUMMER SESSION

For students who at the end of the freshman year elect Electrical Engineering, Engineering Physics, Industrial Engineering, Mechanical Engineering, or Metallurgical Engineering

C.E. 6.....Land and Topographic Surveying..... 4

* A student who presents Advanced Algebra for admission is excused from taking Math. 2. If such a student has not presented entrance credit in Solid Geometry, he takes in the first semester Math. 16, Solid Geometry and Spherical Trigonometry (3). A student who presents for admission both Advanced Algebra and Solid Geometry should ordinarily elect Math. 3, Analytic Geometry, in his first semester.

For students who elect Civil Engineering or Mining Engineering

C.E. 6.....	Land and Topographic Surveying.....	4
C.E. 7.....	Railroad Surveying	2

For students who elect Chemical Engineering or Chemistry there is no required summer session following the freshman year.

Selection of Specialized Curricula

In the spring of his freshman year each engineering student must announce his selection of the particular engineering curriculum which he desires to continue. This announcement must be made by members of the class of 1936 not later than April 7, 1933.

Inspection Trips

Inspection trips to industrial plants are a required part of specific courses in the various curricula in engineering. Written reports or examinations are required. These trips are under the general direction and supervision of the faculty committee on Inspection Trips. They are generally held during the senior year and involve an average expense of about \$25.00. The location of the University in the center of industrial activities of various kinds furnishes unusual opportunities for visits of inspection to engineering plants.

THE CURRICULUM IN CHEMICAL ENGINEERING

The curriculum in Chemical Engineering is designed to prepare the student for the profession of chemical engineer, which includes the design, construction, operation, and management of manufacturing establishments in which chemical products are made. Such substances include paper, gasoline and other petroleum products, cement, coke, gas, dyes, electro-chemical products, paints, rubber, leather, foods, and other substances. In addition to the primary requirement of chemistry in all its branches, the training of the chemical engineer includes a thorough knowledge of physics and mathematics, and a sound understanding of such fundamentals of chemical, mechanical, and electrical engineering as will make him a discriminating research, operating, or sales engineer.

After chemical investigations furnish a better understanding of known processes or develop novel processes or novel methods, it is the particular province of chemical engineering to carry them forward into industrial production. The curriculum is not planned to turn out a specialist restricted to any one type of product; the aim is rather to develop expertness in the sciences and fundamental unit manufacturing processes which underlie all chemical engineering. Some familiarity with factory methods under actual working conditions is acquired through contact with operations in nearby plants. Frequent visits for observation and report are made to manufacturing plants in the immediate neighborhood and in the Philadelphia and New York districts.

THE CURRICULUM IN CHEMICAL ENGINEERING

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Chem. 6	Adv. Chemistry..	3	Chem. 7	Adv. Chemistry..	3
Chem. 30	Quant. Analysis..	3	Chem. 31	Quant. Analysis..	3
Chem. 41	Quant. Anal. Conf.	1	Chem. 45	Quant. Anal. Conf.	1
Ger. 1 or 3	German	3	Ger. 2 or 4	German	3
Math. 4	Elem. Calculus..	3	Math. 5	Inter. Calculus..	3
Phys. 4	Mech., Light, & Sound	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 5	Physics Lab.....	1	Phys. 7	Physics Lab.....	1
Mil. 3	M. S. & T.....	2	Mil. 4	M. S. & T.....	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*M.R. Phil.	Chapel 3	—	*M.R. Phil.	Chapel 4	—
		19			19

SUMMER

Chem. 39....Assaying, Coal, Gas, and Oil Analysis..... 4

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Chem. 78	Chemical Eng..	3	Chem. 161	Organic Chem..	3
Chem. 160	Organic Chem..	4	Chem. 166	Org. Chem. Lab..	3
Chem. 165	Org. Chem. Lab..	2	E.E. 56	Electrical Mach..	2
Met. 23	Fer. Metallurgy..	2	E.E. 57	Dynamo Lab..	1
Met. 83	Met. Problems..	1	M.E. 29	Heat Engines..	3
Ger. 7	German	1	Met. 24	Non-fer. Metal..	2
Biol. 52	or Bacteriol..	3	Met. 84	Met. Problems..	1
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		18			18

SUMMER

M.E. 24....Engineering Laboratory..... 4
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Chem. 162	Adv. Org. Chem.]	2	Chem. 99	Research Lab...	2
Chem. 168	or Industrial Biochemistry]	2	Chem. 138	Ind. Org. Anal..	3
Chem. 180	Chem. Eng. Lab..	3	Chem. 147	Ind. Anal. Conf..	1
Chem. 190	Physical Chem..	3	Chem. 179	History of Chem.	1
Chem. 192	Electrochemistry.	1	Chem. 181	Chemical Eng..	3
Chem. 195	Phys. Chem. Lab.	1	Chem. 185	Chem. Eng. Pract.	1
Chem. 197	Elec. Chem. Lab.	1	Chem. 191	Physical Chem..	2
C.E. 9	Mech. of Materials	3	Chem. 196	Phys. Chem. Lab.	1
	Elective	3		Elective	3
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		17			17

* Taken by students who elect Chapel 1 and 2 during freshman year.

THE CURRICULUM IN CHEMISTRY

The chemist needs a deep insight into the phenomena of matter and into the many processes in which matter undergoes change and their application to the industrial arts. The graduate in chemistry may use his education to discover and investigate hitherto unknown combinations of matter and of energy, or he may apply known facts and principles to new and useful purposes in manufacture or in the arts. In preparation for a professional career, the training is thorough in fundamentals and leads to a comprehensive understanding of the scientific and industrial achievements of chemistry.

The curriculum offers an education primarily in chemistry, with considerable training in related sciences. The modern conception of an education in chemistry includes a co-ordinate study of physics and mathematics. In addition to these so-called physical sciences, other studies, planned to aid and develop the thought-processes and culture of the student, are embodied in the curriculum. It is believed by many practicing chemists and industrial chemists that an undergraduate course such as this one which includes a liberal allotment of study in the humanities is the best preparation for a successful career both in pure science and in the business application of chemistry.

Since the freshman and sophomore years of this curriculum and of the curriculum in Chemical Engineering are the same, it is possible for a student to change from one curriculum to the other at the end of either semester of the sophomore year.

Numerous supervised visits for study and report at large industrial plants in the immediate neighborhood and in the Philadelphia and New York districts are an integral part of the curriculum.

THE CURRICULUM IN CHEMISTRY

FRESHMAN YEAR

See page 60

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Chem. 6	Adv. Chemistry..	3	Chem. 7	Adv. Chemistry..	3			
Chem. 30	Quant. Analysis..	3	Chem. 31	Quant. Analysis..	3			
Chem. 41	Quant. Anal. Conf.	1	Chem. 45	Quant. Anal. Conf.	1			
Ger. 1 or 3	German	3	Ger. 2 or 4	German	3			
Math. 4	Elem. Calculus..	3	Math. 5	Inter. Calculus..	3			
Phys. 4	Mech., Light, & Sound	3	Phys. 6	Elec., Mag., & Heat	3			
Phys. 5	Physics Lab....	1	Phys. 7	Physics Lab....	1			
Mil. 3	M. S. & T....	2	Mil. 4	M. S. & T....	2			
E.C. 3	Eng. Conferences —	—	E.C. 4	Eng. Conferences —	—			
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—			
*M.R. Phil.	Chapel 3	—	*M.R. Phil.	Chapel 4	—			
		—			—			
		19			19			

SUMMER

Chem. 39....Assaying, Coal, Gas, and Oil Analysis..... 4

FIRST SEMESTER			JUNIOR YEAR			SECOND SEMESTER		
Bus. 3	Economics	3	Bus. 4	Economics	3			
Chem. 78	Chemical Eng... ..	3	Chem. 161	Organic Chem... ..	3			
Chem. 160	Organic Chem... ..	4	Chem. 166	Org. Chem. Lab.. ..	3			
Chem. 165	Org. Chem. Lab.. ..	2	Engl. 5, 11 or					
Engl. 4 or 6	English	3	41	English	3			
Ger. 3	German	—	Geol. 4	Gen. Geology. 2	—			
Fr. 1	or French	3	Geol. 6	..... & Field Trips. 1	3			
P.E. 5	Physical Ed.	—	Bus. 18	..... or Accounting	—			
		—	Ger. 4	German	3			
		—	Fr. 2	or French	3			
		—	P.E. 6	Physical Ed.	—			
		—			—			
		18			18			

SUMMER

Chem. 50....Industrial Employment

Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
Chem. 162 .. Adv. Org. Chem.		2	Chem. 99	Research Lab....	2			
Chem. 168 .. or Industrial Biochemistry.. ..	2		Chem. 138	Ind. Org. Anal.. ..	3			
			Chem. 147	Ind. Anal. Conf. ..	1			
Chem. 180 ..Chem. Eng. Lab. ..	3		Chem. 179	History of Chem. ..	1			
Chem. 190 ..Physical Chem.. ..	3		Chem. 181	Chemical Eng... ..	3			
Chem. 192 ..Electrochemistry. ..	1		Chem. 185	Chem. Eng. Pract. ..	1			
Chem. 195 .. Phys. Chem. Lab. ..	1		Chem. 191	Physical Chem.. ..	2			
Chem. 197 ..Elec. Chem. Lab. ..	1		Chem. 196	Phys. Chem. Lab. ..	1			
Any two of the following:			Biol. 153 .. Adv. Bacteriol.. ..					
Biol. 1 ..Biology			Bus. 18	or Accounting				
Biol. 52 ..Bacteriology ..			Met. 24	or Non-fer				
Bus. 25 ..Corp. Finance.. ..								
Met. 23 ..Ferrous Met... 2	6		Met. 84	& Met. Prob. 1				
Met. 83	& Met. Prob. 1		Phys. 161	or Physics... ..				
Phys. 160 ..Physics								
P.E. 7 ..Physical Ed.			P.E. 8	Physical Ed.	—			
		—			—			
		17			17			

* Taken by students who elect Chapel 1 and 2 during freshman year.

THE CURRICULUM IN CIVIL ENGINEERING

The purpose of this curriculum is to give instruction in those general and scientific subjects which form the foundation of all engineering, and a special training in the field of civil engineering, which includes the building of highways, railroads, harbors, docks and terminals, bridges, buildings, subways, tunnels, water supply and purification plants, sewerage systems and sewage disposal plants, water power developments and surveys. To enable the civil engineering graduate to deal with allied technical problems arising in most civil engineering projects of today, the curriculum includes certain special studies in the fields of mechanical and electrical engineering, geology, and metallurgy. Courses in economics, accounting, and finance have been added since it is essential that the graduate should have a knowledge of the fundamentals of business. While no program of humanistic subjects is included in the curriculum it is expected that the non-technical elective work of the junior and senior years will be chosen with the purpose of gaining knowledge of the great and ever-presenting problems of human life, individual and social; accordingly all programs of elective studies must have the approval of the director of curriculum.

Two optional courses of study are provided: a general option and a sanitary engineering option, which differs from the first by the inclusion of work in chemistry, biology, and bacteriology, essential knowledge for engineers dealing with water supply and sewage disposal. In both options the work of the first three years deals chiefly with the scientific and mathematical basis of engineering practice. In the fourth year the application of these basic principles is studied in geodesy, in structural, hydraulic, sanitary, and transportation engineering, the major divisions of the wide field of civil engineering.

The positions open to graduates include those of inspector, timekeeper, and engineering assistant on construction work, instrument man on surveys, draftsman, computer, and engineering apprentice. The last named follows the course of study prescribed by some of the large structural steel and other engineering companies for their beginning engineers.

THE CURRICULUM IN CIVIL ENGINEERING

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Geol. 3	Intro. Geology	2	Geol. 9	Eng. Geology	3
Geol. 6	Field Trips	1	Math. 5	Inter. Calculus	3
Math. 4	Elem. Calculus	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 4	Mech., Light, & Sound	3	Phys. 7	Physics Lab.	1
Phys. 5	Physics Lab.	1	C.E. 16	Highway Eng.	3
C.E. 11	Railroads	3	Chem. 37	or Quant. An.2	3
Chem. 36	or Quant. An.2	3	Chem. 49	& Anal. Conf.1	
Chem. 48	& Anal. Conf.1		Mil. 4	M. S. & T.	2
Mil. 3	M. S. & T.	2	E.C. 4	Eng. Conferences	—
E.C. 3	Eng. Conferences	—	P.E. 4	Physical Ed.	—
P.E. 3	Physical Ed.	—	*M.R. Phil.	Chapel 4	—
*M.R. Phil. Chapel 3		—	—		—
		18			18

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Number	Title	Number	Title	Number	Title
C.E. 10	Mat. Testing Lab.	1	C.E. 15	Stresses	4
Math. 6	Adv. Calculus	3	Math. 21	Anal. Mechanics	3
M.E. 29	Heat Engines	3	C.E. 12	Hydraulics	3
C.E. 8	Mech. of Mat.4		C.E. 14	& Hyd. Lab.1	
E.E. 50	& Dyn. & Mot.2		E.E. 52	& Alt. Cur.2	
E.E. 51	& Dyn. Lab.1	7	E.E. 53	& Dyn. Lab.1	8
Biol. 1	or Biology	3	M.E. 19	& Eng. Lab.1	
C.E. 9	or Mech. Mat.3	8	Biol. 50	or San. Bac.	3
C.E. 13	& Hydraulics.2		C.E. 16	& High. Eng.3	
Elective (non-technical)	.....	3	E.E. 56	& Elec. Mach.2	
P.E. 5	Physical Ed.	—	Elective (non-technical)	.....	3
		—		P.E. 6	
		Physical Ed.		—	
		17 or 18		18	

SUMMER

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Number	Title	Number	Title	Number	Title
C.E. 118	Str. Theory	3	Bus. 18	Accounting	3
C.E. 119	Str. Design	3	C.E. 25	Foundations	2
C.E. 125	Reinf. Concrete	3	C.E. 121	Hyd. & W.P. Eng.	4
C.E. 126	Concrete Lab.	1	C.E. 27	Con. & Spec.	3
C.E. 128	Sanitary Eng.	3	C.E. 122	or Geodesy	3
Met. 21	Eng. Metallurgy	2	C.E. 123	or R.R. & Ter.	3
†Met. 81	Met. Problems	1	C.E. 124	or Str. Th.	3
Elective (non-technical)	.....	3	C.E. 131	or Adv. San. Eng.	3
P.E. 7	Physical Ed.	—	C.E. 132	or Adv. Hgy. Eng.	6
		Eng. 3		Eng. 3	
		C.E. 50		or Thesis	
		or Elective		or Elective	
		Bus. 126		or Pub. Fin.	
		C.E. 131		& Adv. San. Eng.	
		Elective (non-technical)		Eng. 3	
		P.E. 8		Physical Ed.	
		—		—	
		19 or 18		18	

* Taken by students who elect Chapel 1 and 2 during freshman year.

† Not taken by students who elect the Sanitary Engineering option.

THE CURRICULUM IN ELECTRICAL ENGINEERING

The electrical engineer is one who understands the science and art of economically "directing the sources of electrical power in nature for the uses and conveniences of man." He may design, manufacture, install, or operate electrical machinery and appliances, manage plants and electric systems, or engage in the promotion of engineering projects.

The object of this curriculum is to give instruction in those general and scientific subjects which underlie all the branches of engineering, and to give special training in those technical and business subjects which experience shows are most essential to the equipment of the electrical engineer. In seeking to accomplish this object the department puts chief emphasis upon mastery of the mathematical-physical principles and thoroughness in the analysis of problems.

The curriculum includes a number of special studies in civil, mechanical, and metallurgical engineering, so that the graduate in electrical engineering is prepared not only to enter any of the branches of electrical engineering but also to deal with related problems in the other divisions of engineering. The electrical engineering graduate of today finds that professional advancement often lies through commercial, managerial, or executive channels. As superintendent or manager of electric light, power, railway or communication properties he must be prepared to handle problems involving not merely material and technical details but human relations with workmen, capitalists, public utility commissioners, and the public. He must know something of the principles of accounting, economics, business law, and industrial management. A number of such studies have been introduced into the curriculum.

THE CURRICULUM IN ELECTRICAL ENGINEERING

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
E.E. 1	Principles of E.E.	1	E.E. 2	Direct Cur. Mach.	3
Math. 4	Elem. Calculus...	3	E.E. 3	Elem. Dyn. Lab.	1
M.E. 22	Heat Engines...	3	Math. 5	Inter. Calculus...	3
Met. 21	Metallurgy...	2	M.E. 23	Heat Engines...	3
Met. 81	Met. Problems...	1	Phys. 4	Mech., Light, & Sound	3
Phys. 6	Elec., Mag., & Heat	3	Phys. 5	Physics Lab...	1
Phys. 7	Physics Lab...	1	Engl.	English or Foreign Language	3
Engl.	English or Foreign Language	3	MIL 4	M. S. & T...	2
Mil. 3	M. S. & T...	2	E.C. 4	Eng. Conferences	—
E.C. 3	Eng. Conferences	—	P.E. 4	Physical Ed...	—
P.E. 3	Physical Ed...	—	*M.R. Phil.	Chapel 4	—
*M.R. Phil. ...Chapel 3		—			
		19			19

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Number	Title	Number	Title	Number	Title
Biol. 1	Biology	3	Bus. 4	Economics	3
Bus. 3	Economics	3	C.E. 13	Hydraulics	2
C.E. 9	Mech. of Materials	3	C.E. 14	Hydraulics Lab.	1
C.E. 10	Mat. Testing Lab.	1	E.E. 6	Adv. Alt. Cur...	3
E.E. 4	Alt. Currents	3	E.E. 8	Inter. Dyn. Lab.	2
E.E. 5	Inter. Dyn. Lab.	1	Math. 21	Anal. Mechanics	3
Math. 6	Adv. Calculus...	3	Phys. 111	Adv. Elec. Lab.	1
Phys. 110	Adv. Elec. Lab.	1	Geol. 4	Gen. Geology	2
P.E. 5	Physical Ed.	—	Geol. 6	& Field Trips	1
			Psych 1	or Psychology	—
			P.E. 6	Physical Ed.	—
		18			18

SUMMER

E.E. 24	Industrial Employment	
Mil. 9 or 19	or Reserve Officers' Training Corps Camp...	3

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Number	Title	Number	Title	Number	Title
E.E. 11	Adv. Dynamo Lab.	3	Bus. 18	Accounting	3
E.E. 15	E.E. Seminar	1	E.E. 16	E.E. Seminar	2
E.E. 112	A.C. Machinery	3	E.E. 19	Adv. Dynamo Lab.	2
E.E. 114	Elec. Stations	3	E.E. 118	Elec. Power Trans.	3
M.E. 21	Engineering Lab.	1	M.E. 25	Engineering Lab.	1
E.E. 21	Elec. Com.	—	Any two of the following:		
E.E. 23	or Thesis	3	E.E. 20	Elec. Traction	
E.E. 113	or Elec. Design	—	E.E. 23	Thesis	
Bus. 25	Corp. Finance	—	E.E. 26	Elec. Com.	6
Engl. 4	or English	3	E.E. 122	Elec. Transients	
Hist. 13	or History	—	Engl. 5	English	
Math.†	—	—	Math.†	—	
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		17			17

* Taken by students who elect Chapel 1 and 2 during freshman year.

† Students who have completed Math. 21 with high standing may elect Math. 111, 112, 122, 123, or 124 on approval of the director of the curriculum.

THE CURRICULUM IN ENGINEERING PHYSICS

The recognition of the economic value of scientific investigation and the realization that growth and expansion follow upon research have led to the establishment of research laboratories in every field of industry. Scientific research has assumed an importance as a basis of industry equal to the exploitation of natural resources and must in the future become increasingly important as natural resources diminish. The amazing expansion in the electrical industries is to a very large extent the result of research. The statement applies more or less to every major industry, among the products of which may be listed the incandescent lamp, the telephone, radio, automobile, airplane, talking movies, optical glass, and scientific instruments and equipment.

The Bureau of Standards, the Bureau of Mines, the Naval Research Laboratory, and other government laboratories are endeavoring to keep pace with the industrial needs of the country. The universities have reflected the spirit of the age in the expansion of research facilities and research productivity. In every field of industry, government service, and education there is an insistent demand for men trained in the methods and technique of research.

Three avenues are open to the trained physicist: (1) he may enter an industrial research laboratory; (2) he may enter one of the great government laboratories; (3) he may become a university teacher and investigator. The thorough training in fundamentals, coupled with the specialized knowledge obtained through research, is a qualification for administrative work in connection with the products of research.

THE CURRICULUM IN ENGINEERING PHYSICS

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Ger. 1 or 3	German	3	Ger. 2 or 4	German	3
Math. 4	Elem. Calculus..	3	Math. 5	Inter. Calculus..	3
Phys. 6	Elec., Mag., & Heat	3	Phys. 4	Mech., Light, & Sound	3
Phys. 7	Physics Lab....	1	Phys. 5	Physics Lab....	1
Chem. 6	Adv. Chemistry	3	Chem. 7	Adv. Chemistry	3
Geol. 1a	or Mineralogy	3	Geol. 4	or Geology..2	3
Mil. 3	M. S. & T.....	2	Geol. 6	& Field Trips.1	—
E.C. 3	Eng. Conferences	—	Mil. 4	M. S. & T.....	2
P.E. 3	Physical Ed.	—	E.C. 4	Eng. Conferences	—
*M.R. Phil. .Chapel 3	.....	—	P.E. 4	Physical Ed.	—
		—	*M.R. Phil. .Chapel 4		—
		—			—
		18			18

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Number	Title	Number	Title	Number	Title
Math. 6	Adv. Calculus...	3	Math. 21	Anal. Mechanics.	3
Phys. 110	Adv. Elec. Lab..	1	Phys. 111	Adv. Elec. Lab..	1
Phys. 122	Light	3	Phys. 126	Heat	3
Phys. 162	Th. Elec. & Mag.	3	Phys. 163	Th. Elec. & Mag.	3
E.E. 50	Dyn. & Motors.2	—	E.E. 52	Alt. Currents.2	—
E.E. 51	& Dyn. Lab.1	3	E.E. 53	& Dyn. Lab.1	3
M.E. 22	or Heat Eng..	—	M.E. 23	or Heat Eng..	—
Ger. 3	German	3	Ger. 4	German	3
Fr. 1	or French....	3	Fr. 2	or French....	3
	Elective	3		Elective	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		—			—
		19			19

SUMMER

Phys. 50	....Industrial Employment	
Mil. 9 or 19	.... or Reserve Officers' Training Corps Camp	3

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Number	Title	Number	Title	Number	Title
Phys. 124	El. Dis. in Gases.	3	Phys. 120	Electric Waves..	3
Phys. 160	Mod. Theories...	3	Phys. 161	Mod. Theories...	3
Phys. 164	Advanced Lab...	2	Phys. 165	Advanced Lab...	2
C.E. 9	Mech. of Mat...	—	Chem. 191	Phys. Chem...2	—
Chem. 190	or Ph. Chem.3	—	Chem. 196	& Lab....1	—
Chem. 195	& Lab....1	—	E.E. 122	or El. Trans.	—
Geol. 111	or Field Geol.2	3	Geol. 110	or Str. Geol.2	—
Geol. 114	& Str. Geol. 2	—	Geol. 115	& Geol. Meth.2	3
Math. 111	or Ad. Dif. Eq.	—	Math. 112	or Ad. Dif. Eq.	—
Met. 21	or Eng. Met.2	—	Math. 124	or Theo. of Er.	—
Met. 81	& Met. Prob.1	—	Met. 21	or Eng. Met.2	—
	Electives	6	Met. 81	& Met. Prob.1	—
P.E. 7	Physical Ed.	—		Electives	6
		—	P.E. 8		Physical Ed.
		—			—
		17			17

* Taken by students who elect Chapel 1 and 2 during freshman year.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

Industrial engineering has to do with the organization, operation, and management of manufacturing plants, public utilities, and operating, holding, and management companies. Broadly considered, it covers the engineering aspects of plant location, plant layout, routing, production control, maintenance, stores, and inspection; the economic aspects of employment, employee training, promotion, wage payment, bonus, safety and welfare, insurance, and old age pensions; and the commercial aspects of purchasing, marketing, credit, accounting, and finance.

Industrial enterprises depend on sound financing, adequate accounting, and intelligent forecasting of economic developments. Technical skill and engineering efficiency are primary requisites, but these alone are not sufficient. There is a demand by industry for men who have not only a thorough training in the fundamentals of engineering, but also a knowledge of the problems of accounting, finance, statistics, and management which every enterprise encounters. The object of the curriculum in Industrial Engineering is to add a knowledge of the basic facts of economics, finance, and management to the technical knowledge and scientific spirit that come from the study of engineering.

The curriculum in Industrial Engineering is primarily an engineering curriculum supplemented by courses in economics and business administration, so chosen as to provide a thorough training in the fundamental principles of economics, industrial management, corporation financing, and business practice. The curriculum is designed primarily to meet the needs of that considerable body of students who intend to enter industries essentially technical, whether public utilities or manufacturing plants, but who intend to go into the administrative departments.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

For the classes of 1933, 1934, and 1935

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Math. 4	Elem. Calculus.	3	Math. 5	Inter. Calculus.	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
Phys. 6	Elec., Mag., & Heat	3	Phys. 4	Mech., Light, & Sound	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Engl.	English		Engl.	English	
	or Foreign	3		or Foreign	3
	Language			Language	
Govt. 51	or Amer. Govt.		Govt. 52	or Amer. Govt.	
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*M.R. Phil.	Chapel 3	—	*M.R. Phil.	Chapel 4	—
		—			—
		18			18

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Bus. 11	Accounting	3	Bus. 12	Accounting	3
Bus. 21	Corp. Finance	3	Bus. 22	Corp. Finance	3
Bus. 29	Money & Banking	3	Bus. 30	Money & Banking	3
C.E. 9	Mech. of Materials	3	C.E. 13	Hydraulics	2
M.E. 22	Heat Engines	3	C.E. 14	Hydraulics Lab.	1
M.E. 30	Mechanism	3	E.E. 50	Dyn. & Motors	2
P.E. 5	Physical Ed.	—	E.E. 51	Dynamo Lab.	1
		—	M.E. 10	Thermodynamics	3
		—	P.E. 6	Physical Ed.	—
		—			—
		18			18

SUMMER

I.E. 1.....Industrial Employment
Mil. 9 or 19... or Reserve Officers' Training Corps Camp... 3

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Bus. 33	Labor Problems.	3	Bus. 56	Business Law...	3
Bus. 45	Statistics	3	Bus. 126	Public Finance..	3
E.E. 52	Alt. Currents	2	E.E. 54	Electrical Eng...	2
E.E. 53	Dynamo Lab.	1	E.E. 55	Dynamo Lab...	1
I.E. 2	Industrial Man.	3	I.E. 3	Industrial Man..	3
Met. 21	Metallurgy	2	I.E. 4	Industrial Power.	3
Met. 81	Met. Problems	1		Elective	3
	Elective	3	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			—
		—			—
		18			18

* Taken by students who elect Chapel 1 and 2 during freshman year.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

Effective for the classes of 1936 and 1937

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Math. 4	Elem. Calculus.	3	Math. 5	Inter. Calculus.	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
M.E. 2	El. Heat Engines	3	M.E. 5	Heat Engines	3
Phys. 4	Mech., Light, & Sound	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*M.R. Phil.	Chapel 3	—	*M.R. Phil.	Chapel 4	—
		18			18

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
	Arts Option	3		Arts Option	3
Bus. 25	Corp. Finance	3	Bus. 18	Accounting	3
Bus. 29	Money and Bank	3	Bus. 30	Money & Banking	3
E.E. 50	Dyn. & Motors	2	C.E. 10	Mat. Testing Lab.	1
E.E. 51	Dynamo Lab.	1	C.E. 17	Mech. of Materials	2
Met. 21	Metallurgy	2	M.E. 21	Engineering Lab.	1
Met. 81	Met. Problems	1	M.E. 33	Thermodynamics	2
Psych. 1	Psychology	3	Psych. 15	Psychology	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		18			18

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
	Business Option	3		Business Option	3
Bus. 45	Statistics	3	Bus. 46	Business Cycles	3
E.E. 52	Alt. Currents	2	I.E. 3	Industrial Man.	3
E.E. 53	Dynamo Lab.	1	M.E. 31	Appl. Mechanics	3
I.E. 2	Industrial Man.	3	Mine. 15	Mining Eng.	3
M.E. 25	Engineering Lab.	1	Elective		3
M.E. 34	Thermodynamics	2	P.E. 8	Physical Ed.	—
	Elective	3			—
P.E. 7	Physical Ed.	—			18

* Taken by students who elect Chapel 1 and 2 during freshman year.

THE CURRICULUM IN MECHANICAL ENGINEERING

Mechanical engineering deals with the design, construction, installation, and operation of machinery necessary for the economical and advantageous use of power, and with the management of industries and organizations manufacturing and using power-driven equipment. The young graduate ordinarily goes into a graduate apprenticeship in some public utility, manufacturing, or selling organization, from which he may work up to a position as power engineer, works manager, sales engineer, engineering designer, or executive officer.

The freshman and sophomore years of the curriculum are concerned largely with the fundamentals of mathematics, physics, chemistry, and engineering drawing. Machine design and heat engines are begun in the sophomore year. More advanced mechanical engineering subjects include engineering laboratory, thermodynamics, mechanism, advanced heat engines, and advanced machine design. Among the topics considered are fuels, combustion, steam boilers and furnaces, properties of steam, power plant auxiliaries, steam engines, steam turbines, internal combustion engines, power plants, refrigeration, heating and ventilation, pumps, air compressors, and machine tools. Comprehensive tests are made of boilers, power plants, and pumping stations in the neighborhood. Experimental work in engineering laboratory is required throughout the junior and senior years.

THE CURRICULUM IN MECHANICAL ENGINEERING

For the classes of 1933, 1934, and 1935

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Math. 4	Elem. Calculus..	3	Math. 5	Inter. Calculus..	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
M.E. 2	Elem. Heat Eng..	3	M.E. 5	Heat Engines..	3
Phys. 6	Elec., Mag., & Heat	3	Phys. 4	Mech., Light, & Sound	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Engl.	English		Engl.	English	
	or Foreign Language	3		or Foreign Language	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*M.R. Phil.	Chapel 3	—	*M.R. Phil.	Chapel 4	—

18

18

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
C.E. 9	Mech. of Materials	3	E.E. 50	Dyn. & Motors	2
C.E. 10	Mat. Testing Lab.	1	E.E. 51	Dynamo Lab.	1
Math. 6	Adv. Calculus..	3	Math. 21	Anal. Mechanics	3
M.E. 9	Engineering Lab.	1	M.E. 6	Mechanism	4
M.E. 10	Thermodynamics	3	M.E. 11	Engineering Lab.	1
Met. 21	Metallurgy	2	M.E. 108	Heat Engines	3
Met. 33	Metallurgy Lab.	1	Met. 34	Metallurgy Lab.	1
Met. 81	Met. Problems..	1	P.E. 6	Physical Ed.	—
P.E. 5	Physical Ed.	—			

18

18

SUMMER

I.E. 1	Industrial Employment	
Mil. 9 or 19	or Reserve Officers' Training Corps Camp	3

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
C.E. 13	Hydraulics	2	E.E. 54	Electrical Eng..	2
C.E. 14	Hydraulics Lab.	1	E.E. 55	Dynamo Lab.	1
E.E. 52	Alt. Currents	2	M.E. 116	Adv. Design	4
E.E. 53	Dynamo Lab.	1	M.E. 117	Adv. Mech. Eng.	3
M.E. 112	Adv. Design	4	M.E. 118	Engineering Lab.	2
M.E. 113	Adv. Mech. Eng.	3	Engl. 41 or 42	English	
M.E. 114	Engineering Lab.	2	M.E. 15	or Thesis or Elective	3
Bus. 25	Corp. Finance	—			
Bus. 45	or Statistics	3	Bus. 18	Accounting	
I.E. 2	or Ind. Man.	—	Bus. 56	or Bus. Law	3
P.E. 7	Physical Ed.	—	I.E. 3	or Ind. Man.	
			P.E. 8	Physical Ed.	—

18

18

* Taken by students who elect Chapel 1 and 2 during freshman year.

THE CURRICULUM IN MECHANICAL ENGINEERING

Effective for the classes of 1936 and 1937

FRESHMAN YEAR

See page 60

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3			
Math. 4	Elem. Calculus..	3	Math. 5	Inter. Calculus..	3			
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3			
M.E. 2	El. Heat Engines	3	M.E. 5	Heat Engines ...	3			
Phys. 4	Mech., Light, & Sound	3	Phys. 6	Elec., Mag., & Heat	3			
Phys. 5	Physics Lab....	1	Phys. 7	Physics Lab....	1			
Mil. 3	M. S. & T.....	2	Mil. 4	M. S. & T.....	2			
E.C. 3	Eng. Conferences —	—	E.C. 4	Eng. Conferences —	—			
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—			
*M.R. Phil.	Chapel 3	—	*M.R. Phil.	Chapel 4	—			
		18						18

FIRST SEMESTER			JUNIOR YEAR			SECOND SEMESTER		
	Arts Option	3		E.E. 50	Dyn. & Motors...	3		
Bus. 25	Corp. Finance....	3	E.E. 51	Dynamo Lab....	1			
C.E. 10	Mat. Testing Lab.	1	E.E. 21	Anal. Mechanics.	3			
C.E. 17	Mech. of Materials	2	M.E. 11	Engineering Lab.	1			
Math. 6	Adv. Calculus...	3	M.E. 32	Appl. Mechanics.	3			
M.E. 9	Engineering Lab.	1	M.E. 34	Thermodynamics.	2			
M.E. 31	Appl. Mechanics.	3	Met. 21	Metallurgy	2			
M.E. 33	Thermodynamics.	2	Met. 81	Met. Problems...	1			
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—			
		18						18

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
C.E. 12	Hydraulics	3	Bus. 18	Accounting	3			
E.E. 52	Alt. Currents....	2	E.E. 54	Electrical Eng...	2			
E.E. 53	Dynamo Lab....	1	E.E. 55	Dynamo Lab....	1			
M.E. 113	Adv. Mech. Eng.	3	M.E. 117	Adv. Mech. Eng.	3			
M.E. 114	Engineering Lab.	2	M.E. 118	Engineering Lab.	2			
M.E. 121	Adv. Mach. Des.	3	M.E. 122	Adv. Mach. Des.	3			
Met. 33	Metallurgy Lab..	1	Met. 34	Metallurgy Lab..	1			
	Elective	3		Elective	3			
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—			
		18						18

* Taken by students who elect Chapel 1 and 2 during freshman year.

THE CURRICULUM IN METALLURGICAL ENGINEERING

The object of this curriculum is the preparation of the student for practice in engineering generally, and particularly in the fields of metallurgy. These cover three general types of practice, namely: (1) the production, refining, and preparation for use of the metals, such as iron, steel, copper, lead, zinc, aluminum, etc.; (2) the intelligent use of all metals and alloys in industries, for structures, railroads, automobiles, airplanes, machinery, vehicles, pipe, tools, hardware, ordnance, wire products, etc.; (3) the so-called "service" or "sales" division of industry. The day has passed when sales departments can carry on their work without the aid of trained engineers; problems must be discussed with customers which only a man thoroughly trained technically and entirely familiar with the customers' engineering needs and the possibilities of filling these needs with metals or alloys, can intelligently handle.

The purpose of the curriculum is to train men so broadly in the fundamentals of engineering that every graduate shall know the basic principles on which the science of engineering is founded. In addition, some aspects of each department of engineering—chemical, physical, civil, electrical, industrial, mechanical, and mining—are studied briefly.

The metallurgy courses include a development of the basic principles of chemistry, physics, mathematics, and economics as applied to metallurgy. In addition, the student is familiarized with the most modern practice in each division of metallurgy. This instruction is co-ordinated with visits to plants manufacturing or using metals or alloys. For this purpose, Bethlehem, the center of one of the largest industrial districts in the world, is well situated.

THE CURRICULUM IN METALLURGICAL ENGINEERING

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Chem. 33	Quant. Analysis	3	Geol. 4	General Geology	2
Chem. 44	Quant. Anal. Conf.	1	Geol. 6	Field Trips	1
Math. 4	Elem. Calculus..	3	Math 5	Inter. Calculus..	3
Met. 1	Gen. Metallurgy.	2	Met. 33	Metallurgy Lab..	1
Phys. 4	Mech., Light, & Sound	3	Met. 61	Met. Problems..	1
Phys. 5	Physics Lab....	1	Phys. 6	Elec., Mag., & Heat	3
Ger. 1 or 3	German	3	Phys. 7	Physics Lab....	1
Fr. 1 or 11	or French....	3	Ger. 2 or 4	German	3
Mil. 3	M. S. & T.....	2	Fr. 2 or 12	or French....	3
E.C. 3	Eng. Conferences	—	Mil. 4	M. S. & T.....	2
P.E. 3	Physical Ed.	—	E.C. 4	Eng. Conferences	—
*M.R. Phil.	Chapel 3	—	P.E. 4	Physical Ed.	—
			*M.R. Phil.	Chapel 4	—
		18			17

SUMMER

Chem. 39	Assaying, Coal, Gas, and Oil Analysis.....	4
Met. 48	or Industrial Employment	

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Bus. 3	Economics	3	Bus. 4	Economics	3
Chem. 6	Adv. Chemistry..	3	Chem. 98	Physical Chem..	2
C.E. 9	Mech. of Materials	3	E.E. 50	Dyn. & Motors..	2
C.E. 10	Mat. Testing Lab.	1	E.E. 51	Dynamo Lab...	1
Geol. 1a	Mineralogy	3	M.E. 23	Heat Engines..	3
M.E. 22	Heat Engines....	3	Met. 2	Met. of I. & S..	2
Met. 25	Electrochemistry..	2	Met. 44	Plant Visits	1
Met. 35	Elec. Chem. Lab.	1	Met. 62	Met. Problems..	1
P.E. 5	Physical Ed.	—	Met. 130	Physical Met....	3
			P.E. 6	Physical Ed.	—
		19			18

SUMMER

Met. 49	Industrial Employment	
Mil. 9 or 19	or Reserve Officers' Training Corps Camp...	3

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
E.E. 52	Alt. Currents ...	2	Geol. 108	Economic Geol..	3
E.E. 53	Dynamo Lab...	1	Met. 4	Met. of Zinc, Aluminim, etc..	2
M.E. 19	Engineering Lab.	1	Met. 46	Plant Visits	1
Met. 3	Met. of Copper, Lead, Gold, & Silver	2	Met. 132	Metallurgy Lab..	2
Met. 131	Metallography ..	3	Met. 140	Seminar	1
Met. 139	Seminar	2	Met. 152	Adv. Met. I. & S.	2
Met. 163	Met. Problems..	1	Met. 164	Met. Problems..	1
Mine. 3	Ore Dressing	3		Electives	6
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		18			18

* Taken by students who elect Chapel 1 and 2 during freshman year.

THE CURRICULUM IN MINING ENGINEERING

Mining engineering has to do with the extraction of raw materials of economic value from the earth and their preparation for the needs of modern civilization. Mining, therefore, constitutes one of the great basic industries of the present age, as all industries are absolutely dependent upon it, in greater or less degree, for their supplies of metals, coal, petroleum, gas, stone, cement, building materials, and other mineral products which are used in the arts and in manufacturing.

The actual work of mining itself constitutes but a part of the duties which devolve upon the mining engineer, and much of his activity is divided among the broader problems concerning geology, exploration, plant construction, operation and maintenance, transportation, ore treatment and reduction, coal preparation, oil and gas technology, and general administration.

The basic scientific training is given during the first and second years, and includes mathematics, physics, chemistry, mineralogy, geology, with laboratory work; the special technical training is received during the third and fourth years, and includes instruction in mechanics of materials, hydraulics, fuels, generation and utilization of power, metallurgy, economic geology, construction, mining, coal and ore preparation, economics and allied business subjects.

Mining engineers have contributed in large degree to the phenomenal growth in wealth and power of the United States and of the Latin American countries. Mining engineers, as in the past, still continue to be the most important factors in the exploitation and development of the mineral resources of practically every country in the world.

As the fields in which a mining engineer operates present a wide variety of problems, his specific technical training, as influenced by his personal aptitudes, should be directed in general along one of the following lines of activity: mine operation, mining geology, mineral preparation, metallurgy, fuels, construction, or administration. To meet these requirements, the curriculum here presented offers the corresponding elective courses.

THE CURRICULUM IN MINING ENGINEERING

FRESHMAN YEAR

See page 60

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Chem. 36	Quant. Analysis..	2	Chem. 37	Quant. Analysis..	2
Chem. 48	Quant. Anal. Conf.	1	Chem. 49	Quant. Anal. Conf.	1
Geol. 1	Mineralogy	4	Geol. 4	Geology	2
Math. 4	Elem. Calculus..	3	Geol. 5	Petrology	1
M.E. 22	Heat Engines..	3	Geol. 6	Field Trips	1
Phys. 4	Mech., Light, & Sound	3	Math. 5	Inter. Calculus..	3
Phys. 5	Physics Lab.....	1	M.E. 23	Heat Engines..	3
Mil. 3	M. S. & T.....	2	Phys. 6	Elec., Mag., & Heat	3
E.C. 3	Eng. Conferences	—	Phys. 7	Physics Lab.....	1
P.E. 3	Physical Ed.	—	Mil. 4	M. S. & T.....	2
*M.R. Phil.	Chapel 3	—	E.C. 4	Eng. Conferences	—
			P.E. 4	Physical Ed.	—
			*M.R. Phil.	Chapel 4	—
					19

SUMMER

Chem. 39....Assaying, Coal, Gas, and Oil Analysis..... 4

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
C.E. 9	Mech. of Materials	3	C.E. 13	Hydraulics	2
C.E. 10	Mat. Testing Lab.	1	C.E. 14	Hydraulics Lab..	1
Geol. 112	Petrography	2	Engl. 41 or 42	English	3
Mine. 1	Mining Eng.....	3	Met. 21	Metallurgy	2
Mine. 2	Mining Methods..	3	Met. 81	Met. Problems..	1
Mine. 3	Ore Dress., Coal Prep. & Lab.	3	Mine. 5	Mining Eng.....	3
P.E. 5	Physical Ed.	—	Mine. 6	Mine Surveying..	3
			P.E. 6	Physical Ed.	—
					18

SUMMER

Mine. 20....Industrial Employment
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Number	Title	Cr.Hrs.	Number	Title	Cr.Hrs.
E.E. 50	Dyn. & Motors..	2	E.E. 52	Alt. Currents ...	2
E.E. 51	Dynamo Lab....	1	E.E. 53	Dynamo Lab....	1
Geol. 7	Economic Geology	2	Geol. 108	Economic Geology	3
Geol. 111	Field Geology ..	2	Mine. 8	Oil Field Prac...	2
Ten credit hours from following:			Nine credit hours from following:		
Biol. 52	Bacteriology ..	3	Bus. 18	Accounting ..	3
Bus. 25	Corp. Finance	3	Bus. 56	Bus. Law.....	3
C.E. 20	Str. Theory...	2	C.E. 16	Highway Eng.	3
C.E. 125	Reinf. Con....	3	C.E. 30	Str. Design...	3
C.E. 126	Cement Lab..	1	Geol. 109	Paleontology ..	3
Geol. 8	Hist. Geology	3	Geol. 110	Stratigraphy ..	2
Geol. 114	Str. Geology...	2	Geol. 115	Geol. Method ..	2
I.E. 2	Ind. Man....	3	I.E. 3	Ind. Man....	3
M.E. 21	Engine Lab..	1	M.E. 25	Engine Lab..	1
Met. 3	Metallurgy ..	2	Met. 4	Metallurgy ..	2
Met. 25	Electrochem..	2	Mine. 9	Mine Adm. & Law ..	1
Mine. 7	Construction ..	2	Mine. 11	Fuel Tech...	2
Mine. 10	Fuel Tech...	2	Mine. 13	Fuel Tech. Lab.1	
Mine. 12	Fuel Tech. Lab.1		Span. 2 or 12	Spanish	3
Span. 1 or 11	Spanish	3	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			17

* Taken by students who elect Chapel 1 and 2 during freshman year.

DESCRIPTION OF COURSES

Following is a list of the undergraduate and graduate courses offered by Lehigh University. The number of exercises a week in each subject is indicated by the figures in parentheses. Three hours of drawing, of work in the laboratory, or of practice in the field are regarded as equivalent to a recitation or lecture of one hour's duration.

ASTRONOMY

See Mathematics and Astronomy

BIOLOGY

PROFESSORS HALL AND S. J. THOMAS,
MESSRS. TREMBLY AND BURGER

Biol. 1. BIOLOGY. Recitations, lectures, and laboratory work. The recitations and lectures deal with the following topics: (a) fundamental conceptions: life, protoplasm, the cell, etc.; (b) the animal phyla; (c) the more important biological theories: variation, heredity, evolution, etc. In the laboratory, types of the various phyla are studied. Fee, \$3.00. First semester (3).

Biol. 2. MAMMALIAN ANATOMY. Two laboratory periods a week, the work consisting of the detailed dissection of a mammal. Prerequisite: Biol. 1. Fee, \$5.00. Second semester (2).

Biol. 3. COMPARATIVE ANATOMY OF VERTEBRATES. Laboratory work and recitations on the comparative anatomy of vertebrates; laboratory work consisting of the dissection of types of the several vertebrate classes. Prerequisite: Biol. 1. Fee, \$3.00. Second semester (3).

Biol. 4. VERTEBRATE EMBRYOLOGY. Lectures, text-book, and laboratory work. Study of living, preserved, and sectioned material demonstrating the successive stages of cleavage, gastrulation, and the formation of tissues and organs. Prerequisite: Biol. 1 and, preferably, Biol. 3. First semester (3).

Biol. 6. BOTANY. A survey of the subject designed to give the student a general knowledge of plant life, morphology,

physiology, and the classification of the vegetable kingdom. Type species studied in the laboratory and field trips to familiarize the student with plant habitats. Second semester (3).

Biol. 7. ELEMENTARY BIOLOGY. A recitation survey course dealing with the characteristics and the history of living organisms. Special emphasis is laid on the evolution of the lower forms of animal life. Biol. 7 and Biol. 8 form a continuous course and should not be taken separately. First semester (3).

Biol. 8. ELEMENTARY BIOLOGY. Continuation of Biol. 7. The more advanced theories of genetics, eugenics, and human evolution. Prerequisite: Biol. 1 or 7. Second semester (3).

Biol. 9. GENETICS. The laws and the mechanism of heredity and eugenics. Prerequisite: Biol. 1. Second semester (1).

Biol. 15. FRESHMAN HYGIENE. A course of four lectures on social hygiene, with the cooperation of the Director of the Students' Health Service. This course is given during freshman week. Biol. 15 is required of all students. Either this course or Biol. 16 must be passed before graduation.

Biol. 16. SOCIAL HYGIENE. A course for students who for any reason have not taken or have not passed Biol. 15. Second semester.

Biol. 21. HYGIENE. Physiology and anatomy of the human body. The evolution and development of organs and systems, their structures, functions, and interrelationships are studied as a scientific basis for appropriate attitudes and habits concerning health. A recitation course. First semester (3).

Biol. 50. SANITARY BACTERIOLOGY. Study of bacteria and allied microorganisms by staining and cultural methods; their sanitary importance in public water supplies; the bacteriology of sewage and sewage treatment; qualitative and quantitative bacteriological and biological analysis of water and sewage. Lectures, recitations, and laboratory work. Fee, \$3.00. Second semester (3).

Biol. 52. BACTERIOLOGY. An elementary course in general bacteriology. A general study of the morphological and cultural characteristics of bacteria and allied microorganisms; special attention given to those forms of sanitary and eco-

nomic importance; the role of bacteria, yeasts, and molds in fermentation industries, in water and milk, and in disease. Lectures, recitations, and laboratory work. Fee, \$3.00. First semester (3).

Biol. 54. BACTERIOLOGY. A course in elementary bacteriology especially designed for pre-medical students and others specializing in biological sciences. Laboratory work including special staining methods in the study of morphology; differential media in the study of bacterial physiology; and in general a more thorough study of the microorganisms themselves rather than their specific sanitary or industrial importance. Recitations, lectures, and laboratory work. Fee, \$3.00. First semester (3).

For Advanced Undergraduates and Graduates

Biol. 112. HISTOLOGY AND MICROSCOPICAL TECHNIQUE. Two laboratory periods of three hours each. A thorough course in the technique of fixing, cutting, and differential staining of animal tissue, and training in the recognition of various normal tissues. Second semester (2). Mr. Trembley.

Biol. 153. ADVANCED BACTERIOLOGY. A laboratory and seminar course in advanced laboratory technique; a thorough cultural study of the more common pathogenic bacteria; bacteriological laboratory diagnosis of pathological fluids. Prerequisites: Biol. 50, 52, or 54. Fee, \$3.00. Second semester (3). Professor Thomas.

Biol. 158. IMMUNOLOGY. A comprehensive recitation course in the history of the study of immunity and modern theories concerning its mechanism. Prerequisite: Biol. 50 (or 52 or 54). Biol. 153 desirable either previously or concurrently. Second semester (3). Professor Thomas.

For Graduates

Prerequisite for graduate work in biology: the amount of biology usually obtained by an undergraduate majoring in that department. Prerequisite for graduate work in bacteriology: a satisfactory course in undergraduate bacteriology and a sufficient preparation in organic chemistry. Ability to under-

take graduate work in bacteriology must be demonstrated by previous scholastic record, an examination, or both.

Biol. 203. VERTEBRATE HISTOGENESIS AND ORGANOGENESIS. Careful following, in the laboratory, of the development of a vertebrate; tracing of the history of the germ-layers, organs, and tissues; organogenesis dealing with the association of tissues to form organs. First semester (3). Professor Hall.

Biol. 205. HISTORY OF BIOLOGY. A course based on reading, seminars, and written reports. First or second semester (2). Professor Hall.

Biol. 206. BIOLOGICAL THEORIES. A course dealing especially with genetics. First or second semester (2). Professor Hall.

Biol. 207. BIOLOGICAL RESEARCH. In this course a student may pursue investigations in such subjects as embryology, comparative anatomy, genetics, etc., according to his preparation and interests. First semester (3). Professor Hall.

Biol. 208. BIOLOGICAL RESEARCH. Continuation of Biol. 207. Second semester (3). Professor Hall.

Biol. 251. BACTERIOLOGICAL RESEARCH. In this course competent graduate students are given laboratory problems to be worked out under the supervision of the professor of Bacteriology. Prerequisites: Biol. 50 (or 52 or 54) and 153 and at least one semester of organic chemistry. First semester (3). Professor Thomas.

Biol. 252. BACTERIOLOGICAL RESEARCH. Continuation of Biol. 251. Second semester (3). Professor Thomas.

Biol. 253. BACTERIOLOGICAL RESEARCH. May be taken simultaneously with Biol. 251 by graduate students majoring in bacteriology. First semester (2). Professor Thomas.

Biol. 254. BACTERIOLOGICAL RESEARCH. May be taken simultaneously with Biol. 252 by graduate students majoring in bacteriology. Biol. 253 and 254 are given only to graduate students who are majoring in bacteriology. Biol. 251 and its continuation, Biol. 252, may be taken by graduate students minoring in bacteriology. Second semester (2). Professor Thomas.

Biol. 255. INDUSTRIAL BACTERIOLOGY. An advanced course in bacteriology including aspects of industrial chemistry in which bacteria play an essential part in the process, as in the manufacture of acetone, butyl alcohol, acetic and lactic acids, etc. A study of the common contaminating organisms which cause commercial losses in the manufacture of sugar, leather, etc. Prerequisite: Biol. 52 or 54. First semester (3). Professor Thomas.

Biol. 260. SEROLOGY. A laboratory course in the preparation of antigens, immunization of animals, and the study of immune products such as agglutinins, precipitins, bacteriotoxins, lysins, etc. To be taken by graduate students simultaneously with or following Biol. 158. Prerequisites: same as for Biol. 158. First or second semester (3). Professor Thomas.

Biol. 261. ADVANCED PUBLIC SANITATION. A study of the biological, chemical, bacteriological, and physical aspects of public water supplies, systems of sewage disposal, and milk distribution. Prerequisites: at least two years of chemistry, including quantitative analysis, Biol. 50, 52, or 54. First or second semester (3). Professor Thomas.

BUSINESS ADMINISTRATION

PROFESSORS CAROTHERS, COWIN, AND DIAMOND,
ASSOCIATE PROFESSORS BRADFORD AND BISHOP,
ASSISTANT PROFESSORS BRATT, HARING, AND ALLEN,
MESSRS. PAYNE AND BORTH

Bus. 1. INDUSTRIAL EVOLUTION. An introductory course outlining the gradual development of economic organization, with special attention to the stages of economic progress and social institutions growing out of these stages. First semester (3).

Bus. 2. INDUSTRIAL EVOLUTION. Continuation of Bus. 1, with special emphasis on the industrial revolution, the economic history of the United States, and modern industrial enterprises in America. Second semester (3).

Bus. 3. ECONOMICS. A general course in the principles of economics, covering the fundamental forces governing the production, distribution, and consumption of wealth, with emphasis

on value, exchange, money, rent, interest, profits, and wages. Prerequisite: sophomore standing. First semester (3).

Bus. 4. ECONOMICS. Continuation of Bus. 3. Second semester (3).

Bus. 11. ACCOUNTING. A study of the elementary principles of accounting, with sufficient practical work to develop a knowledge of accounting practice; theories of debit and credit; construction of accounts; partnership and corporation accounts; financial statements. First semester (3).

Bus. 12. ACCOUNTING. Continuation of Bus. 11. Second semester (3).

Bus. 15. COST ACCOUNTING. A study of the methods used by manufacturing and commercial enterprises in ascertaining, recording, and controlling costs. Prerequisites: Bus. 11 and 12 or Bus. 18. First semester (3).

Bus. 16. ACCOUNTING SYSTEMS. A special study of various systems of accounts, with emphasis on cost accounting and production control. Prerequisites: Bus. 11 and 12 or Bus. 18. Second semester (3).

Bus. 18. ACCOUNTING FOR ENGINEERS. An intensive course in the principles and practice of accounting, covering the fundamentals in one semester. Especially designed for engineering students. Second semester (3).

Bus. 21. CORPORATION FINANCE. An outline of the methods of corporations in obtaining capital, issuing securities, and extinguishing debts, with attention to the rights and obligations of security holders and to problems of corporation insolvency and dissolution. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 22. CORPORATION FINANCE. Continuation of Bus. 21. Second semester (3).

Bus. 25. CORPORATION FINANCE. An intensive course covering the fundamentals of corporation finance in one semester. Especially designed for engineering students. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 29. MONEY AND BANKING. A study of the nature of money and the principles of banking, with emphasis on coinage systems, monetary standards, paper currency, the economic

functions of banks, bank-note issue, various banking systems, and the Federal Reserve system. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 30. MONEY AND BANKING. Continuation of Bus. 29. Second semester (3).

Bus. 33. LABOR PROBLEMS. A course in the economics of labor, with special reference to the history of labor movements in the United States, forms of labor organizations, and the methods and policies of trades unions. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 34. LABOR PROBLEMS. Continuation of Bus. 33, with emphasis on the problems of the employer, employers' associations, profit-sharing, welfare work, and social insurance. Second semester (3).

Bus. 45. STATISTICS. A study of the methods of statistical description and induction, including tabular and graphic analysis and presentation. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 46. BUSINESS CYCLES AND FORECASTING. A course dealing with the nature of the business cycle and the application of statistics to business trends, with special attention to forecasting and business barometers. Prerequisite: Bus. 45. Second semester (3).

Bus. 49. ECONOMIC GEOGRAPHY. A survey of the geographic factors determining economic development, with special reference to the chief economic materials and to the geographic influences responsible for the economic history and the economic position of the United States. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 50. ECONOMIC GEOGRAPHY. Continuation of Bus. 49. Second semester (3).

Bus. 56. BUSINESS LAW. An intensive one-semester course in the essentials of business law. Prerequisites: Bus. 3 and 4. Second semester (3).

Bus. 57. MARKETING. A course dealing with the distribution of economic goods, with emphasis on the chief agencies of distribution, marketing practice, and the produce exchanges. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 58. ADVERTISING AND SELLING. Continuation of Bus. 57, dealing with the principles and the problems of advertising, sales management, and special methods of selling. Prerequisite: Bus. 57. Second semester (3).

For Advanced Undergraduates and Graduates

Bus. 107. ADVANCED ECONOMICS. An advanced course in the principles of economics, dealing especially with the theory of the distribution of wealth, the nature of the productive process, the history of economic doctrines, and proposed plans of economic reform such as socialism. Prerequisites: Bus. 3 and 4. First semester (3). Professor Diamond.

Bus. 108. ADVANCED ECONOMICS. Continuation of Bus. 107. Second semester (3). Professor Diamond.

Bus. 113. ADVANCED ACCOUNTING. Advanced work in the field of accounting, with emphasis on the problems of assets valuation, corporation accounts, liquidations, and consolidations. Prerequisites: Bus. 11 and 12 or Bus. 18. First semester (3). Professor Cowin.

Bus. 114. ACCOUNTING THEORY. A critical examination of the fundamental principles upon which accounting practice is based, with a consideration of some special relationships between economics and accounting involved in problems of valuation, income and capital charges, and taxation. Prerequisites: Bus. 11 and 12 or Bus. 18. Second semester (3). Professor Cowin.

Bus. 123. INVESTMENTS. A one-semester course which makes a detailed study, from the standpoint of the investor, of the various types of corporation and government securities, with special reference to owners' equities, comparative yields, and the machinery of investment, including stock exchange operations. Prerequisites: Bus. 21 and 22. First semester (3). Associate Professor Bishop.

Bus. 126. PUBLIC FINANCE. A one-semester course dealing with government expenditures and revenues, public debts and taxation, with emphasis on the economics and the administration of federal and state taxes. Prerequisites: Bus. 3 and 4. Second semester (3). Associate Professor Bishop.

Bus. 131. BANKING POLICIES. A course in American banking problems, with emphasis on Federal Reserve policy, operation problems of banks, and regulation. Prerequisites: Bus. 29 and 30. First semester (3). Associate Professor Bradford.

Bus. 132. MONEY MARKETS. Continuation of Bus. 131, dealing with the phenomena of money markets, American and European, including discount and credit conditions, foreign exchange, and international banking. Second semester (3). Associate Professor Bradford.

Bus. 135. PUBLIC UTILITIES. A course in the economics of transportation, with special reference to railways. Prerequisites: Bus. 3 and 4. First semester (3). Associate Professor Bishop.

Bus. 136. PUBLIC UTILITIES. Continuation of Bus. 135, with emphasis on the economics of the public utilities that supply electric light, gas, water, power, and communication services. Second semester (3). Associate Professor Bishop.

Bus. 161. SOCIOLOGY. A study of the nature and the growth of social institutions, with emphasis on evolution, racial developments, social stratification, and the social problems connected with the institutions of private property, family organization, and sex. Prerequisites: Bus. 3 and 4. First semester (3). Professor Carothers.

Bus. 162. SOCIOLOGY. Continuation of Bus. 161. Second semester (3). Professor Diamond.

CHEMISTRY AND CHEMICAL ENGINEERING

PROFESSORS ULLMAN, BABASINIAN, LONG, AND DIEFENDERFER,
ASSOCIATE PROFESSORS EWING, ANDERSON, NEVILLE, AND THEIS,
ASSISTANT PROFESSORS BECK, SIMMONS, BILLINGER, AND
HAZLEHURST, MESSRS. SMULL, DE GRAY,
WILLIAMS, AND KAUFFMANN

Chem. 1. ELEMENTARY CHEMISTRY. Elementary phenomena and principles of chemistry. Lectures illustrated by experiments, diagrams, working drawings, and specimens from the museum. First and second semesters (2).

Chem. 3. INTERMEDIATE CHEMISTRY. A course for students who pass the examination in elementary chemistry held during freshman week. Prerequisite: satisfactory preparation in the rudiments of chemistry. First semester (2).

Chem. 6. ADVANCED CHEMISTRY. Inorganic chemistry. Lecture course with recitations. Theories of chemistry; physical and chemical methods of determining atomic and molecular weights, thermo-chemistry, dissociation, solution, catalysis, electrolysis, radio-activity, non-metallic elements and their compounds. Prerequisites: Chem. 1 and 11, or 3 and 13; 8 and 20. First semester (3).

Chem. 7. ADVANCED CHEMISTRY. Inorganic chemistry. Continuation of Chem. 6. Lecture course with recitations. Electronics, atom structure and phase rule, solid solutions, metallic elements and their compounds and alloys. Collateral reading. Prerequisites: Chem. 1 and 11, or 3 and 13; 8 and 20. Second semester (3).

Chem. 8. STOICHIOMETRY. Chemical problems and reactions. Second semester (1).

Chem. 11. CHEMISTRY LABORATORY. Experiments covering a systematic study of the chemical and physical properties of the more important elements and their compounds. Deposit, \$15.00. First and second semesters (2).

Chem. 12. CHEMISTRY LABORATORY. Primarily for Arts and Science and Business Administration students. An abridgment of Chem. 11. Deposit, \$15.00. First semester (1).

Chem. 13. CHEMISTRY LABORATORY. Experiments designed to accompany Chem. 3. Prerequisite: satisfactory preparation in the rudiments of laboratory chemistry. Deposit, \$15.00. First semester (2).

Chem. 14. CHEMISTRY LABORATORY. Primarily for Arts and Science and Business Administration students. An abridgment of Chem. 13. Deposit, \$15.00. First semester (1).

Chem. 20. QUALITATIVE ANALYSIS. Metals and their industrially interesting compounds. The fundamental scientific principles and the practice of qualitative analysis methods. Accompanied by lectures and demonstrations. Deposit, \$25.00. Second semester (3).

Chem. 21. **QUALITATIVE ANALYSIS.** Similar to Chem. 20 but shorter. Deposit, \$25.00. Second semester (2).

Chem. 30. **QUANTITATIVE ANALYSIS.** Practical work in the quantitative laboratory, accompanied by lectures and recitations; an introduction to gravimetric analytic method and typical fundamental volumetric processes. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. Deposit, \$30.00. First semester (3).

Chem. 31. **QUANTITATIVE ANALYSIS.** Continuation of Chem. 30. Analysis of metallic products, ores, and alloys of industrial interest chosen to represent the application of quantitative chemical principles to analysis. Deposit, \$30.00. Second semester (3).

Chem. 33. **QUANTITATIVE ANALYSIS.** Practical work in the quantitative laboratory. Analysis of simple chemical compounds, ores, and metallurgical products. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. Deposit, \$25.00. First semester (3).

Chem. 36. **QUANTITATIVE ANALYSIS.** Practical work in the quantitative laboratory. Analysis of simple chemical compounds. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. Deposit, \$25.00. First semester (2).

Chem. 37. **QUANTITATIVE ANALYSIS.** Continuation of Chem. 36. Deposit, \$30.00. Second semester (2).

Chem. 39. **ASSAYING, COAL, GAS, AND OIL ANALYSIS.** Lectures and laboratory practice in the furnace assay of the ores of lead, gold, and silver, and of gold and silver bullion; cyanidization; calculations for slags and slag mixtures; laboratory practice and class-room discussion of the analysis of boiler water, mine water, coal, coke, tar, gas, petroleum, and petroleum products; calorimetry. Prerequisites: Chem. 8, and 30, 33, or 36. Deposit, \$30.00. Summer session: a lecture and seven hours of laboratory work each week-day for four weeks. Tuition fee, \$40.00 (4).

Chem. 41. **QUANTITATIVE ANALYSIS CONFERENCE.** Lectures and recitations concerning the scientific foundations and laboratory practice of Chem. 30. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. First semester (1).

Chem. 44. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations pertaining to the laboratory work of Chem. 33. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. First semester (1).

Chem. 45. QUANTITATIVE ANALYSIS CONFERENCE. Continuation of Chem. 41. Lectures and recitations to accompany Chem. 31. Second semester (1).

Chem. 47. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations to accompany Chem. 37. Second semester (1).

Chem. 48. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations to accompany Chem. 36. First semester (1).

Chem. 49. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations to accompany Chem. 37. Second semester (1).

Chem. 50. SUMMER WORK. During the summer following the junior year students in the curriculum in Chemistry are required to gather industrial experience by at least eight weeks' work in industrial shops or laboratories.

Chem. 78. CHEMICAL ENGINEERING. Principles of chemical engineering related to fluid flow and the transportation of solids, liquids, and gases; to machinery and materials of chemical plants; to crushing, grinding and screening; to filtration, sedimentation, and general classification. In addition a thorough analysis of industrial processes is made through assigned reading in texts and current literature and through demonstration lectures. Prerequisites: Math. 4, Chem. 6, 30, and 41. First semester (3).

Chem. 98. PHYSICAL CHEMISTRY. An abridgment of Chem. 190 and 191 for students in the curriculum in Metallurgical Engineering. Prerequisites: Math. 5, Chem. 6 and 33. Second semester (2).

Chem. 99. RESEARCH CHEMISTRY LABORATORY. Advanced stage of study or an investigation approved by the professor of Chemistry of some novel problem, involving exhaustive laboratory and library study. Deposit, \$15.00. Second semester (2).

Deposits to cover breakage, chemicals, etc., are required as indicated above. The unused portion of the deposit is returned to the student.

For Advanced Undergraduates and Graduates

Chem. 134. RADIATION METHODS. The application of radiation methods, mainly X-ray methods, to chemical and industrial chemical problems. First semester (2). Associate Professor Anderson.

Chem. 135. RADIATION METHODS. Continuation of Chem. 134. Second semester (2). Associate Professor Anderson.

Chem. 138. INDUSTRIAL ORGANIC ANALYSIS. A laboratory study of special operations in quantitative analytical chemistry as applied to organic compounds of industrial importance; the chemical analysis of drinking water and of milk is included in this course. Prerequisites: Chem. 31 or 36, and 160. Deposit, \$35.00. Second semester (2). Professor Diefenderfer, Professor Ullmann.

Chem. 139. INDUSTRIAL ORGANIC ANALYSIS. An abridgement of Chem. 138 for students in the curriculum of Civil Engineering. Prerequisites: Chem. 37 and Chem. 47. Deposit, \$25.00. Second semester (2). Professor Ullmann, Professor Diefenderfer.

Chem. 144. RADIATION METHODS LABORATORY. Laboratory practice in connection with Chem. 134. Deposit, \$10.00. First semester (1). Associate Professor Anderson.

Chem. 145. RADIATION METHODS LABORATORY. Continuation of Chem. 144. Deposit, \$10.00. Second semester (1). Associate Professor Anderson.

Chem. 147. INDUSTRIAL ANALYSIS CONFERENCE. Conferences on the principles and the applications of the laboratory methods of industrial organic analysis of Chem. 138. Prerequisites: Chem. 45 and 160. Second semester (2). Professor Diefenderfer.

Chem. 148. INDUSTRIAL ANALYSIS CONFERENCE. Lectures and recitations to accompany Chem. 139. Second semester (1). Professor Diefenderfer.

Chem. 160. ORGANIC CHEMISTRY. Lectures and recitations. A systematic survey of the typical compounds of carbon; their classification and general relations; study of synthetic re-

actions. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21; 30 or 33. First semester (4). Professor Babasinian, Mr. Smull.

Chem. 161. ORGANIC CHEMISTRY. Continuation of Chem. 160. Second semester (3). Professor Babasinian, Mr. Smull.

Chem. 162. ADVANCED ORGANIC CHEMISTRY. An advanced course in certain theories of organic chemistry. Prerequisites: Chem. 160, 165, 161, and 166, with high grades. Given in alternate years. Not given in 1932-1933. First semester (2). Professor Babasinian.

Chem. 163. CHEMISTRY OF DRUGS, DYES, AND RELATED COMPOUNDS. Prerequisites: Chem. 160, 165, 161, and 166 with high grades. Given in alternate years. Not given in 1933-1934. First semester (2). Professor Babasinian.

Chem. 165. ORGANIC CHEMISTRY LABORATORY. Determinations of specific gravities, melting points, boiling points, vapor densities; qualitative and quantitative determinations of carbon, hydrogen, nitrogen, and the halogens; preparation of pure organic compounds. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21; 30 or 33. Deposit, \$30.00. First semester (2). Professor Babasinian, Mr. Smull.

Chem. 166. ORGANIC CHEMISTRY LABORATORY. Continuation of Chem. 165. Practical methods of saturation, nitration, reduction, diazotization, sulphonation, etc.; preparation of pure compounds; study of the properties of dyes and other commercial products. Deposit, \$40.00. Second semester (3). Professor Babasinian, Mr. Smull.

Chem. 167. ORGANIC CHEMISTRY LABORATORY. Similar to Chem. 166 but shorter. Deposit, \$40.00. Second semester (2). Professor Babasinian, Mr. Smull.

Chem. 168. INDUSTRIAL BIOCHEMISTRY. The inorganic, organic, and physical chemistry of life processes and their products. Atomic and molecular structure, equilibria, colloidal state, catalysis, osmosis, synthesis, oxidation, and reduction as applying to carbohydrates, proteins, fats, lipoids, and their interrelations. Prerequisites: Chem. 160 and 165. This course may be taken without Chem. 169. First semester (2). Associate Professor Theis.

Chem. 169. INDUSTRIAL BIOCHEMISTRY LABORATORY. Laboratory work to accompany Chem. 168. Prerequisites: Chem. 160 and 165. Deposit, \$15.00. First semester (1). Associate Professor Theis.

Chem. 179. HISTORY OF CHEMISTRY. Chronological development of the science, with assigned reading. Prerequisites: Chem. 7 and 161. Second semester (1). Professor Ullmann.

Chem. 180. CHEMICAL ENGINEERING LABORATORY. Basic principles of chemical engineering applied to heat transfer, fuels and power, furnaces and kilns, gas producers and combustion engineering; vaporization processes and evaporation; design and cost data on unit processes and manufacturing plants; laboratory work including study of precipitation, filtration, thickening and settling, classification, centrifuging, fluid transfer, heat transfer, pyrometry, drying, evaporation, distillation, and absorption. Visits to industrial plants in the Philadelphia area for inspection of large units are an integral part of the course. Prerequisites: Math. 5, Chem. 31, 45, 78, 160, and 165. Deposit, \$25.00. First semester (3). Assistant Professor Simmons.

Chem. 181. CHEMICAL ENGINEERING. Continuation of Chem. 180, including a study of humidity and psychrometry, humidifiers and coolers, drying, refrigeration, distillation, diffusional processes, absorption, extraction, crystallization, calculations of engineering design and assigned reading in chemical engineering economics and current literature. Visits to industrial plants in the New York area are a part of the course. Prerequisite: Chem. 190. Second semester (3). Assistant Professor Simmons.

Chem. 184. TANNING TECHNOLOGY. Special development of inorganic, organic, chemico-physical, biochemical and allied sciences as applied to control and research in tanning and allied fields. Principles of design and operation of apparatus and machinery of the leather industry. Prerequisites: Chem. 161, 168, and 190. First semester (3). Associate Professor Theis.

Chem. 185. CHEMICAL ENGINEERING PRACTICE. Comprehensive studies in nearby manufacturing plants of a few processes in-

volving one or more unit engineering operations, these studies usually occupying time covering whole days or multiples thereof. Deposit, \$10.00. Prerequisite: Chem. 180. Second semester (1). Assistant Professor Simmons, Associate Professor Theis.

Chem. 190. PHYSICAL CHEMISTRY. Lectures and recitations. Prerequisites: Math. 5, Chem. 7, and 31 or 35. First semester (3). Associate Professor Ewing.

Chem. 191. PHYSICAL CHEMISTRY. Continuation of Chem. 190. Second semester (2). Associate Professor Ewing.

Chem. 192. ELECTROCHEMISTRY. Chemical reactions in gases, solutions, and molten electrolytes caused by the electric current. Quantitative relations between electromotive force, electrical energy, and chemical energy. Efficiency and applicability of typical processes. Prerequisites: Math. 5, Chem. 7, and 31 or 35. First semester (1). Associate Professor Ewing.

Chem. 195. PHYSICAL CHEMISTRY LABORATORY. Physical chemical measurements. Prerequisites: Math. 5, Chem. 7, and 31 or 35. Deposit, \$10.00. First semester (1). Associate Professor Ewing.

Chem. 196. PHYSICAL CHEMISTRY LABORATORY. Continuation of Chem. 195. Deposit, \$10.00. Second semester (1). Associate Professor Ewing.

Chem. 197. ELECTROCHEMISTRY LABORATORY. Experimental study of electrochemical reactions; current efficiencies, electromotive force measurements and overvoltage; transport numbers; electrochemical preparations. Prerequisites: Math. 5, Chem. 7, and 31 or 35. Deposit, \$5.00. First semester (1). Associate Professor Ewing.

For Graduates

The prerequisites for graduate work in chemistry as a major study are: Inorganic Chemistry (8), Qualitative Analysis (4), Quantitative Analysis (8), Organic Chemistry (10), Physical Chemistry (5), Physics (12), and Mathematics, including Calculus, (12). Students of exceptional ability may be able to make up minor deficiencies while carrying graduate work. If the deficiencies are serious, a student can hardly expect to complete the requirements for the master's degree within the minimum time.

Chem. 200. INORGANIC CHEMISTRY RESEARCH. Investigation in the field of inorganic chemistry and in drying oils and their metallic salts. Prerequisites as in the statement above introductory to graduate courses. Deposit, \$30.00. First semester (4). Professor Long, Associate Professor Neville.

Chem. 201. INORGANIC CHEMISTRY RESEARCH. Continuation of Chem. 200. Deposit, \$30.00. Second semester (4). Professor Long, Associate Professor Neville.

Chem. 202. ADVANCED INORGANIC CHEMISTRY. A course of conference and reading in the generalizations of inorganic chemistry. Prerequisites as in the statement above introductory to graduate courses and a reading knowledge of German and French. First semester (2). Professor Long, Associate Professor Neville.

Chem. 203. ADVANCED INORGANIC CHEMISTRY. Continuation of Chem. 202. Second semester (2). Professor Long, Associate Professor Neville.

Chem. 230. QUANTITATIVE ANALYSIS RESEARCH. Investigation of problems in analytic procedures. Prerequisites as in the statement above introductory to graduate courses. Deposit, \$30.00. First semester (4). Professor Ullmann, Professor Diefenderfer.

Chem. 231. QUANTITATIVE ANALYSIS RESEARCH. Continuation of Chem. 230. Deposit, \$30.00. Second semester (4). Professor Ullmann, Professor Diefenderfer.

Chem. 236. X-RAY RESEARCH. The investigation of chemical and industrial problems by X-ray diffraction methods. Prerequisites as in the statement above introductory to graduate courses. Deposit, \$30.00. First semester (3). Associate Professor Anderson.

Chem. 237. X-RAY RESEARCH. Continuation of Chem. 236. Deposit, \$30.00. Second semester (3). Associate Professor Anderson.

Chem. 260. ORGANIC CHEMISTRY RESEARCH. Investigation of a problem in organic chemistry with particular reference to the dye industry. Prerequisite: a course substantially equivalent to Chem. 161 and 165. Deposit, \$30.00. First semester (4). Professor Babasinian.

Chem. 261. ORGANIC CHEMISTRY RESEARCH. Continuation of Chem. 260. Deposit, \$30.00. Second semester (4). Professor Babasinian.

Chem. 265. ADVANCED ORGANIC PREPARATIONS. Mainly a laboratory course. Prerequisite: Chem. 165. Deposit, \$30.00. First semester (2). Professor Babasinian.

Chem. 266. ADVANCED ORGANIC PREPARATIONS. Continuation of Chem. 265. Deposit, \$30.00. Second semester (2). Professor Babasinian.

Chem. 280. INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING RESEARCH. Investigation of a problem in chemical engineering or in industrial chemistry. Prerequisites: for problems in industrial chemistry as in the statement above introductory to graduate courses; for investigation of a problem in chemical engineering, an undergraduate curriculum in chemical engineering substantially equivalent to the curriculum in this University. Deposit, \$30.00. First semester (4). Professor Ullmann, Associate Professor Theis, Assistant Professor Simmons, Assistant Professor Billinger.

Chem. 281. INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING RESEARCH. Continuation of Chem. 280. Deposit, \$30.00. Second semester (4). Professor Ullmann, Associate Professor Theis, Assistant Professor Simmons, Assistant Professor Billinger.

Chem. 282. CHEMICAL ENGINEERING. Advanced consideration of chemical engineering energetics, hydrodynamics, and heat transfer applied to evaporation, distillation, crystallization, filtration, combustion, and refrigeration. A portion of these are carried in Chem. 283. Prerequisites: courses substantially equivalent to the undergraduate curriculum in chemical engineering in this University. First semester (3). Associate Professor Theis, Assistant Professor Simmons.

Chem. 283. CHEMICAL ENGINEERING. Continuation of Chem. 282. Second semester (3). Associate Professor Theis, Assistant Professor Simmons.

Chem. 285. TANNING TECHNOLOGY. Continuation of Chem. 184. Second semester (3). Associate Professor Theis.

Chem. 286. TANNING ENGINEERING PRACTICE. A laboratory course to accompany Chem. 184. Experimental scientific studies in a small tannery of modern design of the major tanning and leather finishing processes. Visits to and studies in industrial tanneries. Deposit, \$30.00. First semester (3). Associate Professor Theis.

Chem. 287. TANNING ENGINEERING PRACTICE. Continuation of Chem. 286. Deposit, \$30.00. Second semester (3). Associate Professor Theis.

Chem. 288. CHEMICAL ENGINEERING PROCESS DESIGN. The applications of chemical engineering principles in the design of unit process equipment and the coordination of such units into organized production. Problems involving such processes as evaporation, distillation, drying, filtration, absorption, etc., are investigated in the laboratory, in the drafting room, and in operating plants. Prerequisites: courses substantially equivalent to the undergraduate curriculum in chemical engineering in this University. Deposit, \$30.00. First semester (3). Associate Professor Theis, Assistant Professor Simmons.

Chem. 289. CHEMICAL ENGINEERING PROCESS DESIGN. Continuation of Chem. 288. Deposit, \$30.00. Second semester (3). Associate Professor Theis, Assistant Professor Simmons.

Chem. 290. PHYSICAL CHEMISTRY RESEARCH. Investigation of a problem in physical chemistry; vapor pressure and calorimetric studies in the constitution of inorganic salts. Prerequisites: the equivalent of Chem. 190, 191, 195, and 196. Deposit, \$30.00. First semester (4). Associate Professor Ewing.

Chem. 291. PHYSICAL CHEMISTRY RESEARCH. Continuation of Chem. 290. Deposit, \$30.00. Second semester (4). Associate Professor Ewing.

Chem. 292. THEORETICAL CHEMISTRY: KINETICS. Prerequisites: a good working knowledge of mathematics and the equivalent of Chem. 190, 191, 195, and 196. Given in alternate years. Not given in 1932-1933. First semester (3). Assistant Professor Hazlehurst.

Chem. 293. THEORETICAL CHEMISTRY: KINETICS. Continuation of Chem. 292. Second semester (3). Assistant Professor Hazlehurst.

Chem. 294. THEORETICAL CHEMISTRY: THERMODYNAMICS. Prerequisites: a good working knowledge of mathematics and the equivalent of Chem. 190, 191, 195, and 196. Given in alternate years. Not given in 1933-1934. First semester (3). Assistant Professor Hazlehurst.

Chem. 295. THEORETICAL CHEMISTRY: THERMODYNAMICS. Continuation of Chem. 294. Second semester (3). Assistant Professor Hazlehurst.

Chem. 296. COLLOIDS. Theories and applications of colloidal behavior. Lectures and seminar with occasional demonstrations. Prerequisites as in statement introductory to graduate courses. First semester (3). Associate Professor Neville.

Chem. 297. CATALYSIS. Theories of catalytic mechanism; preparation, activation, and control of catalysis; the applications of catalysis in various types of chemical reactions and in certain industrial processes; special topics in inorganic chemistry. Lectures, seminar, demonstrations. Prerequisites as in statement above introductory to graduate courses. Second semester (3). Associate Professor Neville.

Chem. 298. ADVANCED PHYSICAL CHEMISTRY. A course arranged to go forward from courses in elementary physical chemistry. Collateral reading required. Prerequisites as in the statement above introductory to graduate courses. Second semester (3). Associate Professor Ewing.

Chem. 299. PHYSICAL CHEMISTRY METHODS. Advanced course in methods of physical chemistry laboratory practice. Prerequisites: the equivalent of Chem. 195 and 196. Deposit, \$30.00. First semester (2). Associate Professor Ewing.

CIVIL ENGINEERING

PROFESSORS SUTHERLAND AND WILSON,
ASSOCIATE PROFESSORS S. A. BECKER AND FULLER,
ASSISTANT PROFESSORS PAYROW, UHLER, JENSEN, AND LYSE,
MR. KEYSER

C.E. 1. ENGINEERING DRAWING. The use of drawing instruments; lettering and tracing; mechanical drawing of objects;

simple projections; isometric drawing; principles of descriptive geometry. First semester (2).

C.E. 2. ENGINEERING DRAWING. Continuation of C.E. 1. Working drawings; applications of descriptive geometry. Prerequisite: C.E. 1. Second semester (2).

C.E. 6. LAND AND TOPOGRAPHIC SURVEYING. The theory and practice of land surveying, including computation of areas, dividing land, determining heights and distances; map drawing and topographic signs; field work with level and transit; map drawing from students' field notes; theory and use of stadia; detailed field work in rough country; pen topography and contour maps. A recitation and seven hours of field work each week-day for four weeks at summer camp. Tuition fee, \$40.00. Prerequisite: C.E. 1 (4).

C.E. 7. RAILROAD SURVEYING. Reconnaissance, preliminary and location methods, with the theory of curves. A recitation and seven hours of field work each week-day for two weeks at summer camp immediately following C.E. 6. Tuition fee, \$20.00. Prerequisite: C.E. 6 (2).

C.E. 8. MECHANICS OF MATERIALS. The physical properties of structural materials; theory of beams, columns, and shafts, with the solution of many practical problems. Prerequisite: Math 5. First semester (4).

C.E. 9. MECHANICS OF MATERIALS. An abridgment of C.E. 8. Prerequisite: Math. 5. First semester (3).

C.E. 10. MATERIALS TESTING LABORATORY. Fourteen experiments made by each student on wood, iron, and steel to determine the action of materials under stress and to study the physical properties of materials of construction. The work is done in the Fritz Engineering Laboratory. Concurrent with C.E. 8, 9, or 17. Fee, \$5.00. First semester (1).

C.E. 11. RAILROADS. Theory of curves and turnouts; preparation of profiles and maps; the computation of earth work and estimates of cost; the construction of road-bed, including ballast, cross ties, rails, switches, culverts, and other details. Prerequisite: C.E. 7. First semester (3).

C.E. 12. HYDRAULICS. Hydrostatics and theoretical hydraulics; the flow of water through orifices, weirs, tubes, pipes, and channels; naval hydromechanics; hydraulic motors; the solution of many practical problems. Prerequisite: Math 5. Second semester (3).

C.E. 13. HYDRAULICS. An abridgment of C.E. 12. Prerequisite: Math. 5. First and second semesters (2).

C.E. 14. HYDRAULICS LABORATORY. Fourteen experiments made by each student in the hydraulics section of the Fritz Engineering Laboratory, which is equipped with pumps, weirs, turbines, water-wheels, meters, and other apparatus for special work. Concurrent with C.E. 12 or 13. Fee, \$5.00. Second semester (1).

C.E. 15. STRUCTURAL THEORY: STRESSES. Algebraic and graphic determination of stresses in roof and bridge trusses under dead, live, and wind loads; locomotive wheel loads on plate girders and bridge trusses. Prerequisite: C.E. 8 or 9. Second semester (4).

C.E. 16. HIGHWAY ENGINEERING. The location, construction, and maintenance of roads and pavements; highway design. Prerequisite: C.E. 6; highly desirable, C.E. 7. Second semester (3).

C.E. 17. MECHANICS OF MATERIALS. A brief course somewhat more advanced in content than C.E. 8 or C.E. 9. Required in the curricula of Industrial Engineering and Mechanical Engineering. Prerequisites: Math. 5 and M.E. 4. First and second semesters (2).

C.E. 20. STRUCTURAL THEORY. Analysis of stresses in beams and trusses; study of the principles of design of structural members. An elective course for mining engineers. Prerequisite: C.E. 9. First semester (2).

C.E. 25. FOUNDATIONS. Construction and design. Second semester (2).

C.E. 27. CONTRACTS AND SPECIFICATIONS. Lectures on the essentials of contracts and specifications for engineering structures. Prerequisite: junior standing. Second semester (3).

C.E. 29. INDUSTRIAL EMPLOYMENT. During the summer following the junior year, students are required to spend at least

eight weeks in shop work or on engineering construction, and are required to submit a written report.

C.E. 30. STRUCTURAL DESIGN. Design of mine structures in steel and wood. An elective course for mining engineers. Prerequisite: C.E. 20. Second semester (3).

C.E. 50. THESIS. Thesis may be taken only by students of outstanding ability. Second semester (3).

For Advanced Undergraduates and Graduates

C.E. 118. STRUCTURAL THEORY. Study of the principles of design of structural members of wood and steel. Concurrent with C.E. 119. Prerequisite: C.E. 15. First semester (3). Professor Sutherland.

C.E. 119. STRUCTURAL DESIGN. Application of the principles studied in C.E. 118 to the design both of individual structural members and certain complete structures, principally a plate girder bridge, a steel building frame, and a truss bridge. Concurrent with C.E. 118. Prerequisite: C.E. 15. First semester (3). Assistant Professor Uhler.

C.E. 121. HYDRAULIC AND WATER POWER ENGINEERING. Three recitations and one drawing-room exercise a week devoted to systems of water supply, including purification methods, reservoirs, pipe lines, pumping plants; the design of a water supply distribution system; the measurement of flow in open channels by means of tubes and meters; water power; irrigation. Prerequisite: C.E. 12 or 13. Second semester (4). Assistant Professor Payrow.

C.E. 122. GEODESY. Recitations, calculations, field work. Precise leveling; adjustment of instruments and investigation of their systematic errors; elements of least squares and their application to the adjustment of triangulations; field work in triangulation, in determination of azimuth, and with the plane table. Prerequisite: C.E. 6. Second semester (3). Professor Wilson.

C.E. 123. RAILROADS AND TERMINALS. Maintenance of way and the elements of railroad operation. Lectures on the economics of railroad location; the arrangement of yards, stations, and terminals; train resistance; the application of electricity to

the operation of railroads. Prerequisite: C.E. 11. Second semester (3). Professor Wilson.

C.E. 124. STRUCTURAL THEORY. Stress analysis with a brief introduction to the study of stresses in indeterminate structures. Prerequisite: C.E. 15. Second semester (3). Professor Sutherland.

C.E. 125. REINFORCED CONCRETE DESIGN. Theory of reinforced concrete; design of reinforced concrete buildings, bridges, and retaining walls. Prerequisite: C.E. 8 or 9; highly desirable: C.E. 15. First semester (3). Associate Professor Fuller.

C.E. 126. CONCRETE LABORATORY. The manufacture, properties, and testing of cement, mortar, and concrete; tests on reinforced concrete beams and columns in the Fritz Engineering Laboratory. Concurrent with C.E. 125. Fee, \$5.00. First semester (1). Associate Professor Fuller.

C.E. 128. SANITARY ENGINEERING. Systems of sewerage and methods of sewage treatment and disposal; the design of a sewerage system; house drainage. Prerequisite: C.E. 12 or 13. First semester (3). Assistant Professor Payrow.

C.E. 131. ADVANCED SANITARY ENGINEERING. Continuation of C.E. 128. Second semester (3). Assistant Professor Payrow.

C.E. 132. ADVANCED HIGHWAY ENGINEERING. Continuation of C.E. 16. Second semester (3). Associate Professor Becker.

For Graduates

The following courses are open to engineering graduates only. The prerequisite for any course listed is the undergraduate course of similar title. Math. 217 and 218, Theory of Elasticity, may be included in a graduate major as though given in the department of Civil Engineering.

C.E. 201. ADVANCED STRUCTURAL THEORY. The design and investigation of statically indeterminate structures of steel and reinforced concrete, including arches. First semester (4). Professor Sutherland.

C.E. 202. ADVANCED STRUCTURAL THEORY. Continuation of C.E. 201. Second semester (4). Professor Sutherland.

C.E. 205. RAILROAD ENGINEERING. The economic location of railroads, as influenced by probable volume of traffic and cost of construction and operation; a study of the virtual profile in reducing gradients, with discussion of special cases. First semester (2). Professor Wilson.

C.E. 206. RAILROAD ENGINEERING. Continuation of C.E. 205. Second semester (2). Professor Wilson.

C.E. 207. SANITARY AND HYDRAULIC ENGINEERING. The designing of reservoirs, tanks, and pipe lines for water supply systems, and of sewers and other appurtenances for sewerage systems. Inspection of existing plants, with reports thereon. First semester (4). Assistant Professor Payrow.

C.E. 208. SANITARY AND HYDRAULIC ENGINEERING. Continuation of C.E. 207. Second semester (4). Assistant Professor Payrow.

C.E. 209. STRUCTURAL SEMINAR. Study of current discussion in the field of structural theory and design. First semester (2). Professor Sutherland.

C.E. 210. STRUCTURAL SEMINAR. Continuation of C.E. 209. Second semester (2). Professor Sutherland.

C.E. 211. REINFORCED CONCRETE. Results of research during the past thirty years on the principles of design of reinforced concrete members and structures. First semester (3). Assistant Professor Lyse.

C.E. 212. RESEARCH METHODS. Study of principles of research as applied to engineering materials; measuring instruments, testing machines. First semester (3). Assistant Professor Lyse.

C.E. 213. CONCRETE. Results of research during the past thirty years on the designing of concrete with reference to quality (strength, permeability, shrinkage, etc.). Second semester (3). Assistant Professor Lyse.

C.E. 215. STRUCTURAL MATERIALS. Laboratory and theoretical studies in the field of structural materials. First or second semester (3). Assistant Professor Lyse.

ECONOMICS**See Business Administration****EDUCATION****PROFESSOR H. P. THOMAS, MR. LAFFERTY**

Attention is also called to the statement concerning preparation for teaching, in the description of the College of Arts and Science.

Educ. 1. INTRODUCTION TO TEACHING. An orientation course required of all students who plan to enter the teaching profession. A general introduction to the field of education giving a broad survey of the work of the teacher and of the public schools. This course is required for the College Provisional Certificate. Should be taken during the junior year or earlier. First semester (3).

Educ. 20. EDUCATIONAL PSYCHOLOGY. An introductory course furnishing a psychological foundation immediately related to educational problems and practice. The major units are: the foundations of human motivation, learning, individual differences, psychology of school subjects, and growth and development. Practical problems involving analysis of designated material are assigned regularly for solution and report. This course is required for the College Provisional Certificate. Should be taken during the junior year. Prerequisite: Psych. 1. Second semester (3).

Educ. 51. PRINCIPLES OF HIGH SCHOOL TEACHING. A study of basic methods of secondary instruction. The central aims are the organization of courses around criticized objectives and the conduct of classes along the lines of individualized instruction. Subsidiary problems and methods considered are: the objectives of education in relation to the curriculum; socialized procedure; the problem-project method; the contract plan; types of teaching related to different fields; directed study. This course is recommended for the College Provisional Certificate. Should be taken during the senior year with Educ. 53. Prerequisites: Educ. 1 and 20. First semester (3).

Educ. 53. OBSERVATION OF SECONDARY SCHOOL TEACHING. Study, directed observation, and discussion of the various

phases of teaching activity in high schools in or near Bethlehem. The class meets two hours each week. In addition, detailed reports are required for forty observation periods. This course is required for the College Provisional Certificate. Prerequisites: Educ. 1, 20, and 51. Educ. 51 may be taken the same semester. First semester (3).

Educ. 54. PRACTICE TEACHING OF SECONDARY SCHOOL SUBJECTS. An intensive practical application of the principles of teaching to classroom conditions. The class meets two hours each week, in sections according to major interests, for the study of teaching procedure, actual organization, and planning of courses around definite objectives. In addition, forty periods of acceptable supervised practice in the handling of classes and in the giving of instruction in high schools in or near Bethlehem are required. Students registering for this course must have at least one free hour at the same time each day throughout the week. Required for the College Provisional Certificate. Prerequisite: Educ. 53. Second semester (3).

For courses in special methods, see Lat. 10 and 109, Ger. 21, P.E. 22, 23, and 24.

For Advanced Undergraduates and Graduates

Educ 119. SOCIAL POLICY AND EDUCATION. A critique of the aims of education in the modern social order. The main points discussed are: the nature, needs, and adjustments of modern industrial society; the conflicting demands upon education by a changing civilization as represented by various modern social points of view; and the implications, for education, of contemporary American philosophy of democratic social progress. The discussion is made concrete in terms of practical conclusions drawn for guidance of educational method and practice. Prerequisite: consent of the instructor. Not given in 1934-1935. First semester (3). Dr. Lafferty.

Educ. 120. THEORIES OF LEARNING AS REFLECTED IN EDUCATIONAL PRACTICE. An advanced study of human learning, particularly in relation to common teaching situations. Attention is given to: motivation, so far as it is related; types, conditions, and principles of learning with application to the direction and improvement of learning; individual differences

in learning; and the effect of different methods of learning upon transfer of training. Emphasis is placed upon recent experimental literature. Prerequisites: Educ. 1, 20, and 51 or their equivalent. Second semester (2). Dr. Lafferty.

Educ. 130. HISTORY OF EDUCATION IN EUROPE. The aim of this course is to understand modern education not only by showing how far it arises out of the thought and practices of the past, but by understanding how education has been related to the peculiar social and intellectual needs and conditions of its various periods. The course begins with a brief survey of the Greek, Roman, and early Christian periods; gives special attention to the late medieval and early modern periods; and closes with a summary of European movements since the Revolution. Prerequisite: six hours in Education. Summer session (3).

Educ. 131. HISTORY OF EDUCATION IN THE UNITED STATES. A study of the development of primary, secondary, and higher education in the United States. This course deals with the aims, curricula, methods, and systems of education, through five periods from Colonial times to the present, in relation to the social conditions and processes. Prerequisite: six hours in Education. Not given in 1933-1934. First semester (3). Dr. Lafferty.

Educ. 150. PRINCIPLES OF SECONDARY EDUCATION. A course dealing with the aims, organization, and materials of secondary education, characteristics of secondary school pupils, and a general treatment of the problems of secondary education. An introductory course to the field of secondary education. This course is recommended for the College Provisional Certificate. Prerequisite: consent of the instructor. Second semester (3). Dr. Lafferty.

Educ. 171. ELEMENTARY EDUCATIONAL STATISTICS. This course is designed to give teachers and high school principals the techniques necessary to enable them to gather data and present the results of work in their classrooms and schools. It aims to provide a practical knowledge of the simpler statistical methods for use in handling common problems and in understanding educational literature. Prerequisite: consent of the instructor. Not given in 1933-1934. First semester (2). Professor Thomas, Dr. Lafferty.

For Graduates

The major in education on a graduate level is intended primarily for students preparing for high school administration and supervision. If any such student plans to combine administration and high school teaching he is expected to supplement his major with such further work in the field of his teaching as his advisor and the major professor in the field of teaching may recommend.

For students who want the master's degree for high school teaching, a major in education is not advised. The major should be taken in the field in which the student is teaching or preparing to teach, under the guidance of the major professor in that field. A minor in Education for these students is recommended. This minor should include three hours in methods of teaching the student's special subject or Educ. 251.

Students interested in preparing for high school positions in guidance and counseling should consult with the head of the department.

At least four semester courses in education are prerequisite for a graduate major in this field. The prerequisites may be taken concurrently with a partial major program. Attention is called to Educ. 119, 120, 130, 131, 150, and 170, all of which are open to seniors and graduate students, and which may be accepted towards a major or a minor in education.

Educ. 221. PSYCHOLOGY OF SECONDARY SCHOOL SUBJECTS. An analysis of the psychological development and behavior of secondary school pupils in connection with high school subjects. The course is developed around the main high school branches including also reading and arithmetic. In a subsidiary fashion attention is given to diagnostic work. Laboratory work is required. Prerequisites: Educ. 1, 20, and 51 or equivalent. Not given in 1933-1934. First semester (2). Dr. Lafferty.

Educ. 251. MODERN TRENDS IN HIGH SCHOOL TEACHING. This course is designed for the teacher in service and for principals who wish a knowledge of the most recent developments in the technique of teaching. Special attention is given to experimental studies in the field of method. Not given in 1934-1935. Prerequisites: consent of the instructor. First semester (2). Dr. Lafferty.

Educ. 253. SECONDARY SCHOOL ADMINISTRATION. This course is concerned with the major problems of organization and administration of secondary schools. Topics to be considered include the program of studies, the teaching staff, pupil personnel, plant and equipment, and community relationships. This is one of the courses required for a principal's certificate. Prerequisite: Educ. 150 or its equivalent. Not given in 1934-1935. First semester (2). Professor Thomas.

Educ. 254. THE SECONDARY SCHOOL CURRICULUM. This course is related to Educ. 253, but is organized in such a way that it may be taken independently. Required for the principal's certificate. The purpose of this course is to acquaint students with the methods of study of curriculum problems, with the selection of subject matter in various fields, with the principles of program construction and similar problems. Prerequisite: Educ. 150 or its equivalent. Not given in 1934-1935. Second semester (2). Professor Thomas.

Educ. 256. SUPERVISION IN SECONDARY SCHOOLS. This course is related to Educ. 253 and 254. However, due to its organization, it may be taken independently. Another required course for the principal's certificate. The course deals with the purpose of supervision, a program for the improvement of teaching, the evaluation of teaching, measurement, supervisory relationships, and similar problems involved in the supervision of instruction in secondary schools. Prerequisite: Educ. 150 or its equivalent. Not given in 1933-1934. Second semester (2). Professor Thomas.

Educ. 274. MEASUREMENT IN SECONDARY EDUCATION. The purpose of this course is to acquaint students with the selection of educational tests, the organization of a testing program, the use of tests in classification, the construction of classroom tests, the use of tests in improving high school teaching and diagnosis of pupil difficulties. Not given in 1934-1935. Second semester (3). Professor Thomas.

Educ. 280. GUIDANCE IN SECONDARY SCHOOLS. The general principles of guidance are the concern of this course. Major

emphasis is upon educational and vocational guidance. Discovery of interests and abilities, study of occupations, study of educational opportunities, guidance activities, group programs, student personnel problems are topics for consideration in this course. Current practices are carefully examined. For advanced work in this field attention is called to the seminar and individual research courses. Not given in 1933-1934. Second semester (3). Professor Thomas.

Educ. 291-292. SEMINARS. One seminar is organized in each half year provided three or more students elect such work. These courses do not duplicate the courses of individual research. It is the purpose of seminar courses to provide for cooperative study of special problems in the field of secondary education. The following problems in particular are appropriate for this type of study:

Counseling in Secondary Schools.

The Administration of Extra-Curricular Activities.

Self Survey of a Secondary School through a Program of Measurement.

The Development of a Junior High School Organization in a Particular School System.

The Organization and Administration of a Guidance Program.

These problems are merely suggestive. Any similar problem in secondary school organization and administration may be used as a basis for a seminar course. During the first semester this work is organized on the basis of one of the first three problems listed. Prerequisite: consent of the instructor. First and second semesters (2 or 3). Professor Thomas, Dr. Lafferty.

Educ. 293-294. INDIVIDUAL INSTRUCTION, FIELD WORK, OR RESEARCH. These courses are open to students with appropriate preparation and needs for pursuing independent investigation. The student must have shown interest and capacity for advanced work in the chosen field evidenced in part by an approved plan of work. Prerequisite: consent of the instructor. First and second semesters (2 or 3). Professor Thomas, Dr. Lafferty.

ELECTRICAL ENGINEERING

PROFESSORS SEYFERT AND BEAVER, ASSOCIATE PROFESSOR CREEDY,
ASSISTANT PROFESSORS GRUBER, A. R. MILLER, AND HIBSHMAN,
MESSRS. FORMHALS AND KNUTSON

E.E. 1. PRINCIPLES OF ELECTRICAL ENGINEERING. Electric units and electric circuits; electric power and energy; resistance computations; electrolytic conduction; the magnetic circuit; the magnetic field. Prerequisites: Phys. 1, Math. 2, 3, and 20. (Phys. 6, 7 and Math. 4 simultaneously.) First semester (1).

E.E. 2. DIRECT-CURRENT MACHINERY. Study of induced and generated potentials; magnetic properties of iron and steel; force on a conductor; the construction, operation, and control of direct-current machinery, armature windings; characteristic curves. Illustrative problems. Prerequisites: Phys. 6, 7, Math. 4, and E.E. 1. Second semester (3).

E.E. 3. DYNAMO LABORATORY, ELEMENTARY. Introductory course supplementing the class work of E.E. 2. Experimental studies and tests of direct-current generators, motors, and appliances, for characteristics, regulation, efficiency, insulation, etc. Prerequisites: E.E. 1, Phys. 6 and 7. (E.E. 2 simultaneously.) Fee, \$6.00. Second semester (1).

E.E. 4. ALTERNATING CURRENTS, ELEMENTARY. Alternating-current conceptions; study of circuit laws for series and parallel circuits containing R, L, and C; vector methods; complex quantities; single- and poly-phase circuits and measurement of power; alternating-current instruments. Lectures, recitations, and problem work. Prerequisites: Math. 5, Phys. 6 and 7, E.E. 2. First semester (3).

E.E. 5. DYNAMO LABORATORY, INTERMEDIATE, DIRECT CURRENT. Continuation of E.E. 3. Advanced testing of direct-current machines. Alternating-current circuit experiments. Prerequisites: E.E. 2 and 3. Fee, \$6.00. First semester (1).

E.E. 6. ALTERNATING CURRENTS, ADVANCED. Continuation of E.E. 4. Non-sinusoidal waves (Fourier analysis); mutual inductance; transformer; the induction motor; introduction to synchronous machines. Lectures, recitations, and problem work. Prerequisites: Math. 6, E.E. 4. Second semester (3).

E.E. 8. DYNAMO LABORATORY, INTERMEDIATE, ALTERNATING CURRENT. Continuation of E.E. 5. Advanced testing of direct-current machines; alternating-current machinery testing begun. Lectures on methods of testing direct-current machinery and transformers. Prerequisites: E.E. 4 and 5. Fee, \$6.00. Second semester (2).

E.E. 11. DYNAMO LABORATORY, ADVANCED. Advanced experimental studies and tests of direct- and alternating-current generators and motors, synchronous converters, transformers, and auxiliary apparatus. Lectures on methods of testing alternating-current machinery. Prerequisites: E.E. 6 and 8. Fee, \$12.00. First semester (3).

E.E. 15. ELECTRICAL ENGINEERING SEMINAR. A weekly meeting for discussion of topics from the current journals of theoretical and applied electricity. Presentation of papers on assigned topics. Prerequisite: E.E. 6. First semester (1).

E.E. 16. ELECTRICAL ENGINEERING SEMINAR. Continuation of E.E. 15. Prerequisite: E.E. 15. Second semester (2).

E.E. 19. DYNAMO LABORATORY, ADVANCED. Continuation of E.E. 11. Advanced alternating-current machinery testing. Prerequisites: E.E. 11 and 112. Fee, \$12.00. Second semester (2).

E.E. 20. ELECTRIC TRACTION. The construction, equipment, and operation of different types of electric railways. The application of electric traction under steam railroad conditions; the dynamics of electric train movements; predeterminations of speed-time curves and the power required for different types of runs; choice of car equipment; cost of construction and of operation; testing of railway systems. Prerequisites: E.E. 112 and 114. Second semester (3).

E.E. 23. THESIS FOR DEGREE OF B.S. IN ELECTRICAL ENGINEERING. Each candidate for this degree may elect to present a thesis upon a subject chosen by the candidate during the first semester of the senior year. The work upon which the thesis is based may be done during either the first or second semester of the senior year and consists in part of reading from references furnished by the professor in charge, and in part of independent work in theory, experimental research, or designing. Reports of progress on thesis work are required from time to time during the semester. Much importance is attached

to the thesis as evidence of the candidate's ability to carry out an independent investigation. First and second semesters (3).

E.E. 24. SUMMER WORK. During the vacation following the junior year each student in Electrical Engineering is required to spend at least eight weeks in getting practical experience in some approved shop or plant. A written report on the shop or plant, and the experience gained therein, is due December 3. These reports should contain such calculations, photographs, drawings, and plots as each individual case may require.

E.E. 50. DYNAMOS AND MOTORS, GENERAL. An abbreviated course adapted to those students who do not continue this subject in the following year; the principles and practice of direct-current engineering, including the elementary theory, construction, operation, and control of direct-current generators and motors, electromagnets, solenoids; illustrative problems. Prerequisite: Phys. 5. First and second semesters (2).

E.E. 51. DYNAMO LABORATORY, BEGINNING. Introductory course supplementing the class work of E.E. 50. Experimental studies and tests of direct-current generators and motors for characteristics, regulation, efficiency, etc. Requisite: E.E. 50 concurrently. Fee, \$6.00. First and second semesters (1).

E.E. 52. ALTERNATING CURRENTS, GENERAL. A course following E.E. 50; the principles and practice of alternating-current engineering; the theory of alternating currents with applications to alternating-current generators, motors, transformers, and other apparatus; systems of transmission and distribution. Prerequisite: E.E. 50. First and second semesters (2).

E.E. 53. DYNAMO LABORATORY, INTERMEDIATE. Continuation of E.E. 51, supplementing the class work of E.E. 52 and 54. Advanced testing of direct-current machines; practice in operating and testing alternating-current apparatus. Prerequisites: E.E. 50 and 51 (E.E. 52 or 54 concurrently). Fee, \$6.00. First and second semesters (1).

E.E. 54. ELECTRICAL ENGINEERING, APPLICATIONS. A course particularly adapted to students who do not specialize further along electrical lines; systems of generation, transmission, distribution, and utilization taken up in order; under utilization special attention given to the application of electric motors

to various industries; estimates and costs; problems. Prerequisites: E.E. 50, 51, and 52. Second semester (2).

E.E. 55. DYNAMO LABORATORY, ADVANCED. Continuation of E.E. 53, consisting of advanced direct- and alternating-current studies and tests. Primarily for non-electrical students taking more than the usual two semesters of dynamo laboratory. Prerequisites: E.E. 52 and 53. Fee, \$6.00. Second semester (1).

E.E. 56. ELECTRICAL MACHINERY. An abbreviated course covering the elementary principles of direct- and alternating-current machinery adapted to students requiring a minimum of electrical engineering, including: construction and operation of direct- and alternating-current generators and motors, transformers, converters, and related equipment. Prerequisite: Phys. 5. Second semester (2).

E.E. 57. DYNAMO LABORATORY, COMBINED. A brief course covering the simpler tests on direct- and alternating-current circuits and apparatus accompanying the class work of E.E. 56. Requisite: E.E. 56 concurrently. Fee, \$6.00. Second semester (1).

For Advanced Undergraduates and Graduates

E.E. 112. ALTERNATING-CURRENT MACHINERY. Study of the structural details, characteristics, and operation of alternators, alternating-current motors, synchronous converters, and transformers. Prerequisite: E.E. 6. First semester (3). Professor Beaver.

E.E. 113. ELECTRICAL DESIGN. Application of electric, magnetic, and mechanical principles to the design of direct-current generators and transformers; predetermination of characteristics and performance; armature winding. Lectures, recitations, problems, drafting. Prerequisites: E.E. 6 and 8. First semester (3). Professor Beaver.

E.E. 114. ELECTRIC STATIONS. Consideration of prime movers; generating machinery, discussion of types and operation; auxiliary machinery and transformers; storage batteries and their application; switch-boards, measuring and protective devices; design and arrangement; station characteristics; substations; operation and management; methods and principles of rate making; visits to neighboring plants. Prerequisites:

C.E. 13, M.E. 23, E.E. 6 or 52. First semester (3). Professor Seyfert.

E.E. 117. ELECTRICAL DESIGN. Continuation of E.E. 113. Application of electric, magnetic, and mechanical principles to the design of alternators and induction motors; predetermination of characteristics and performance; rotor and stator windings. Lectures, recitations, problems, and drafting. Prerequisites: E.E. 11 and 112. Second semester (3). Professor Beaver.

E.E. 118. ELECTRIC POWER TRANSMISSION. The long distance transmission of power by electricity; mathematical determination of line constants, regulation, efficiency, power limits, interference, transients, etc.; switching and protection of circuits. Prerequisites: E.E. 112 and 114. Second semester (3). Professor Seyfert.

E.E. 121. ELECTRICAL COMMUNICATION, I. The principles of wire and radio communication. Class work includes a physical and mathematical analysis of the fundamental telephone and telegraph circuits and constants, the propagation of electric waves along wires and cables, transmission problems and practice, carrier current communication, and the elements of radio communication. Laboratory work consists of experimental checks upon the theory developed in the class room. Prerequisite: E.E. 4 or 52. Fee, \$6.00. First semester (3). Mr. Knutson.

E.E. 122. ELECTRIC TRANSIENTS. A recitation, lecture, and laboratory course in elementary electric transients, designed to give a physical and quantitative idea of the more common transients occurring in electrical circuits, apparatus, and transmission lines; oscillograms of transients obtained in the laboratory to substantiate the theory of the classroom. Prerequisites: Math. 6, E.E. 11 and 112. Fee, \$6.00. Second semester (3). Assistant Professor Miller.

E.E. 126. ELECTRICAL COMMUNICATION, II. A survey of the methods of electrical communication, principles of various systems of wire telegraphy, wire telephone, radio telegraphy and telephony, and laboratory measurements on radio and other communication circuits. Prerequisite: E.E. 4 or 52. Fee, \$6.00. Second semester (3). Mr. Knutson.

E.E. 127. DIELECTRIC PHENOMENA. A study of the fundamental principles of electrostatic and magnetic fields, laws of corona, etc., and their applications in the field of electrical engineering. Prerequisites: E.E. 112, Math. 21. Second semester (3). Assistant Professor Miller.

For Graduates

For graduate students intending to take their major subjects in electrical engineering a preparation equivalent to the work required for the B.S. in E.E. degree is necessary. Math. 225, Operational Calculus, may be included as a graduate major in electrical engineering.

Graduate courses are given to qualified men from the industries of the surrounding district. To suit the convenience of these men the work is carried on in evening sessions.

E.E. 203. ELECTRICAL DESIGN. A course consisting of pre-determinations by calculation of the characteristics, regulation, and performance of electrical machinery. Analysis and use of designing constants. Design of special machines. First semester (3). Professor Beaver.

E.E. 204. ELECTRICAL DESIGN. Continuation of E.E. 203. Second semester (3). Professor Beaver.

E.E. 207. ELECTRICAL TESTING. Special experimental research in electrical engineering: regulation of alternators, rectifiers, harmonic synthesis and analysis, transmission behavior, or special problems of interest to the student. Fee, \$12.00. First semester (3). Professor Seyfert, Assistant Professor Hibshman.

E.E. 208. ELECTRICAL TESTING. Continuation of E.E. 207. Fee, \$12.00. Second semester (3). Professor Seyfert, Assistant Professor Hibshman.

E.E. 209. RADIO COMMUNICATION. The theory underlying the various sending and receiving systems, and the propagation of electromagnetic waves, combined with experimental work in connection with the department's wireless equipment. First semester (3). Mr. Knutson.

E.E. 210. RADIO COMMUNICATION. Continuation of E.E. 209. Second semester (3). Mr. Knutson.

E.E. 211. ELECTRIC TRANSIENTS. The theory of transients in the more complicated types of electrical circuits, electrical apparatus, and transmission lines, as applied in electrical engineering; oscillograms of all transient phenomena discussed taken in the laboratory. Two lectures and one laboratory period a week. Fee, \$6.00. First semester (3). Assistant Professor Miller.

E.E. 212. ELECTRICAL TRANSIENTS. Continuation of E.E. 211. Treatment of circuits and transients by operational calculus methods. Second semester (3). Assistant Professor Miller.

E.E. 213. ADVANCED THEORY OF POWER TRANSMISSION. A course covering methods of determining the exact solution of transmission line problems; study of line transients and short circuits; problems on power limits and stability of systems. First semester (3). Professor Seyfert, Assistant Professor Miller.

E.E. 214. ADVANCED THEORY OF POWER TRANSMISSION. Continuation of E.E. 213. Second semester (3). Professor Seyfert, Assistant Professor Miller.

E.E. 215. VACUUM TUBES AND THEIR APPLICATIONS. A mathematical and physical consideration of electronic discharges in vacuum and in gases. The applications of these principles to the diode, triode, tetrode, pentode, photoelectric cells, etc. A detailed study of the static and dynamic characteristics of these tubes. The use of vacuum tubes in radio, television, rectification, and miscellaneous industrial fields. First semester (3). Mr. Knutson.

E.E. 216. VACUUM TUBES AND THEIR APPLICATIONS. Continuation of E.E. 215. Second semester (3). Mr. Knutson.

E.E. 217. THE ECONOMICS OF ELECTRIC POWER. A treatment of economic principles as applied to the design, selection, and use of electrical apparatus, plants, and systems; the adjustment of fixed charges and operating expenses by the application of Kelvin's law to problems of generation, transmission, conversion, distribution, and utilization of electric power. First semester (3). Professor Beaver.

E.E. 218. THE ECONOMICS OF ELECTRIC POWER. Continuation of E.E. 217. Second semester (3). Profesor Beaver.

ENGLISH

PROFESSORS SMITH AND LUCH, ASSOCIATE PROFESSOR RILEY,
MESSRS. SLOANE, GRAMLEY, DEPTULA, FLETCHER, SEVERS, GALE,
PHY, HELMS, KOST, EHRSAM, AND HARDING

Engl. 0-1-2-3a-3b. FRESHMAN COMPOSITION AND LITERATURE. The freshmen are distributed, upon the basis of preliminary tests given during freshman week, into three groups: low, English 0; middle, English 1; high, English 3a. The low group receives drill in grammar and in the mechanics of composition; the middle group studies exposition; the high group reads widely in literature as a basis for critical writing.

Engl. 1 and 2 constitute the minimum freshman requirement. Since no college credit is given for Engl. 0, students in the low group are required to take Engl. 2 either in summer session or during the second year, in order to complete the six required hours. A student whose work shows that he has been placed in the wrong group may be transferred to the higher or to the lower group at any time during the year, if his instructor recommends and the head of the department approves the transfer. First and second semesters (3).

Engl. 3a. TYPES OF WORLD LITERATURE. A study of the masterpieces of world literature. Required of freshmen in the high group, and recommended for students, especially sophomores, who are taking a major in literature. First semester (3).

Engl. 3b. TYPES OF WORLD LITERATURE. Continuation of Engl. 3a. Second semester (3).

ENGLISH LITERATURE AND COMPOSITION

Students wishing a major in English literature should take as preliminary work either Engl. 3a, 3b, or 4, 5, or such equivalent courses as may be recommended by the head of the department. They should then elect two English courses in the junior year and at least two in the senior year. Students working for honors take a seminar course in which they prepare a thesis as part of the honors requirement.

Engl. 4. A STUDY OF THE DRAMA. Reading and critical study of types of the drama; theories of the drama; the drama and the stage; the drama as a criticism of life. Required of English majors. First semester (3).

Engl. 5. A STUDY OF THE DRAMA. Continuation of Engl. 4. Second semester (3).

Engl. 6. THE MODERN ESSAY. An advanced composition course in writing essays and narrative types with a study of leading modern essayists. Prerequisites: Engl. 1 and 2. First semester (3).

Engl. 7. THE SHORT STORY. A critical study of the short story, English, American, and continental. Class discussions, extensive collateral reading, and reports. Prerequisites: Engl. 1 and 2. Second semester (3).

Engl. 18. THE NOVEL. A study of types of the novel. Reading and reports. Lectures on the history of the novel in England and America. First semester (3).

Engl. 19. THE NOVEL. Continuation of Engl. 18. Second semester (3).

Engl. 20. AMERICAN LITERATURE, 1607-1855. Lectures, textbook, and supplementary reading. First semester (3).

Engl. 21. AMERICAN LITERATURE, 1855 TO THE PRESENT. Continuation of Engl. 20. Second semester (3).

Engl. 41. BUSINESS CORRESPONDENCE. The basic principles of letter writing for the business man and engineer. Practice in writing letters of inquiry, application letters, sales letters, adjustment letters, credit letters, letters of reply, and collection letters. Prerequisites: Engl. 1 and 2. First and second semesters (3).

Engl. 42. WRITING FOR BUSINESS. Study and practice of all types of reports which the engineer or business man must write, from the short letter report to the long technical report. Writing for house organs, employees' magazines, trade and technical journals. Prerequisites: Engl. 1 and 2. First and second semesters (3).

Engl. 61. DRAMATICS. A course in the practical technique in the drama. Study of assigned plays with particular reference to the theories and practical problems of production. The course includes supervision of and participation in plays produced under the direction of the department of English. Prerequisite: sophomore standing and consent of the instructor in charge of the course. First semester (3).

Engl. 62. DRAMATICS. Continuation of Engl. 61. Second semester (3).

For Advanced Undergraduates and Graduates

The courses in this group are open to students of junior standing or with the consent of the head of the department.

Engl. 100. GREEK LITERATURE IN ENGLISH TRANSLATION. Required reading of the Greek literary masterpieces in the best English translations available. Special attention is given to the following types of literature: epic, drama, literary criticism, and lyric poetry. Students are expected to read the whole of the *Iliad* and the *Odyssey*, and the principal tragedies and comedies not already studied in other courses. First semester (3). Professor Smith, Professor Luch, Associate Professor Riley.

Engl. 115. THE BIBLE AS LITERATURE. An outline study of the history of the origin and of the transmission of the books that make up the Bible; a survey of the chief translations, especially in as far as they are of literary importance; a more detailed study of the types of literature found in the Bible; and an estimate of the influence of the Bible upon world literature, with special reference to English literature. First semester (3). Professor Luch.

Engl. 116. THE BIBLE AS LITERATURE. Continuation of Engl. 115. Second semester (3). Professor Luch.

Engl. 117. CONTEMPORARY DRAMA. A study of types of the drama. Summer session (3). Professor Luch.

Engl. 120. THE NINETEENTH CENTURY NOVEL. A critical study of the masterpieces of the English, the American, and the European novel in the nineteenth century. Summer session (3). Associate Professor Riley.

Engl. 121. CONTEMPORARY LITERATURE. A study of present-day American writers exclusive of the drama. Collateral readings and reports. First semester (3). Professor Luch.

Engl. 122. CONTEMPORARY LITERATURE. A study of present-day English and European writers exclusive of the drama. Collateral reading and reports. Second semester (3). Professor Luch.

Engl. 123. SHAKESPEARE AND THE ELIZABETHAN DRAMA. A study of the development of the English drama to 1642, including the important plays of Shakespeare. First semester (3). Professor Smith.

Engl. 124. SHAKESPEARE AND THE ELIZABETHAN DRAMA. Continuation of Engl. 123. Second semester (3). Professor Smith.

Engl. 125. ENGLISH LITERATURE OF THE ROMANTIC ERA. First semester (3). Professor Smith, Mr. Severs.

Engl. 126. ENGLISH LITERATURE OF THE VICTORIAN AGE. Second semester (3). Professor Smith, Mr. Severs.

Engl. 131. MILTON AND THE SEVENTEENTH CENTURY. A survey of the life and literature of the seventeenth century with special study of Milton. Not given in 1933-1934. First semester (3). Associate Professor Riley.

Engl. 132. EIGHTEENTH CENTURY LITERATURE. A study of the writings of Pope, Swift, and other Augustans, followed by a study of Dr. Johnson and his circle. Not given in 1933-1934. Second semester (3). Mr. Sloane.

For Graduates

Students desiring to major in English literature should have had at least twelve semester hours in connection with their undergraduate work that bear upon this field of study or in other ways should satisfy the department that they are in a position to undertake profitably the required program for the master's degree. Students should register for graduate work only after consultation with the head of the department.

Engl. 220. GRADUATE SEMINAR. An intensive study of the works of an English author. Summer session (3). Professor Smith.

Engl. 221. GRADUATE SEMINAR. Research and reports. First semester (3). Professor Smith.

Engl. 222. GRADUATE SEMINAR. Continuation of Engl. 221. Second semester (3). Professor Smith.

Engl. 227. ANGLO-SAXON. A study of the Anglo-Saxon language and literature. Lectures and supplementary reading in the history of the English language and its relation to other

Indo-European languages. First semester (3). Associate Professor Riley.

Engl. 228. CHAUCER. A study of the life and principal works of Chaucer, with some attention to his chief contemporaries. Lectures, readings, class discussions, and reports. Second semester (3). Associate Professor Riley.

Engl. 229. LITERARY CRITICISM. A course aimed to correlate and unify the student's previous work in literature by means of wide reading in critical literature and discussions of theories and schools of criticism. First semester (3). Professor Smith.

Engl. 230. LITERARY CRITICISM. Continuation of Engl. 229. Second semester (3). Professor Smith.

PUBLIC SPEAKING

Engl. 10. PUBLIC SPEAKING. A foundation course in the various types of public address. Particular stress is laid in this course upon ability to think in spoken discourse and to attain ease and proficiency in the use of body and voice. First semester (3).

Engl. 11. PUBLIC SPEAKING. A course giving training beyond that of Engl. 10. Analysis of the psychological aspects of the speech situation; study of models; delivery of speeches prepared for audiences of various kinds. Second semester (3).

JOURNALISM

Students majoring in journalism take Engl. 43, 44, 46, 50, 51, and 54. They must also complete four semesters of Engl. 71-78. Other requirements include twelve hours to be chosen from the following courses: Engl. 4, 5, 6, 7, 123, and 124 or such equivalents as may be allowed; and also Hist. 25 and 26, Govt. 51 and 52, Psych. 1 and 4, Bus. 3, 4, 161, and 162. During the junior or senior year a field trip to New York is taken to visit metropolitan newspaper plants. The comprehensive examination in journalism includes the content of courses studied in the sophomore, junior, and senior years.

Engl. 43. NEWSPAPER REPORTING AND WRITING. A beginning course in newspaper journalism. Definition of news; news values and reader interest; structure of the news story; news-

paper English; how to report and write simple news stories. Copy is handled by the instructor as it would be in a newspaper editorial room. Prerequisites: Engl. 1 and 2. Fee, \$2.00. First semester (3).

Engl. 44. ADVANCED NEWSPAPER REPORTING AND WRITING. Continuation of Engl. 43. A course in the reporting and writing of particular types of news. Fee, \$2.00. Second semester (3).

Engl. 45. FEATURE AND MAGAZINE WRITING. Writing all kinds of feature articles from newspaper "brighteners" to essays of opinion, personality sketches, etc., of magazine length. A different current magazine is studied each week as a model. Prerequisite: Engl. 42 or 43, or special permission. Fee, \$1.50. Given in 1933-1934. First semester (3).

Engl. 46. NEWSPAPER EDITING AND COPY READING. Study and practice of the technique of the newspaper copy reader and news editor; headline writing and makeup. Prerequisites: Engl. 43 and 44. Fee, \$1.50. First semester (3).

Engl. 50. EDITORIAL WRITING AND MODERN PROBLEMS. The content and technique of the editorial. Discussion of modern problems and review of individual prejudices as preliminary to writing of editorials on contemporary events. A study of the editorial pages and policies of leading American newspapers. Prerequisite: junior standing. Not given in 1933-1934. First semester (3).

Engl. 51. NEWSPAPER PROBLEMS AND POLICIES. A study of the ethical principles of newspaper publishing: "To print or not to print"; sensational or "yellow" journalism; tabloids; faking; ghost writing; crusades. Study of the law of libel and of postal regulations governing newspapers; review of rights of fair comment and criticism as they relate to books, drama, and other public offerings. Prerequisite: junior standing. Not given in 1933-1934. Second semester (3).

Engl. 53. HISTORY OF AMERICAN JOURNALISM. English background of American newspaper; development of press from colonial days to the present; influence of newspaper on American life; contributions of outstanding journalists from Benjamin Franklin and Peter Zenger to Joseph Pulitzer and Wil-

liam Randolph Hearst. Prerequisites: Engl. 43 and 44 or Hist. 13 and 14. Second semester (3).

Engl. 54. JOURNALISM SEMINAR. Required of students of senior standing who are majoring in journalism. Survey of the newspaper field in its relation to public affairs; review of recent American history as background for study of current events. Extensive reading in books, magazines, and newspapers. Second semester (3).

Engl. 71-78. BROWN AND WHITE. Enrollment constitutes membership on the staff of the semi-weekly paper. All composition work is for publication. Students enrolling for their first semester sign for Engl. 71; for their second semester, Engl. 72; etc. By faculty action this course may be elected each semester for credit in addition to other courses on a student's roster. Students also enroll in Engl. 71-78 for the business staff of the paper. No prerequisites. Fee, \$1.00. First and second semesters (1).

FINE ARTS

ASSISTANT PROFESSOR HOWLAND

F.A. 1. HISTORY AND APPRECIATION OF THE FINE ARTS. Presentation of elementary principles that enable the beginner to attain some knowledge and enjoyment of the fine arts; the historical development of art traced through the ancient and mediæval periods. Lectures. First semester (3).

F.A. 2. HISTORY AND APPRECIATION OF THE FINE ARTS. Continuation of F.A. 1. The art of the Renaissance and present day. Second semester (3).

F.A. 3. HISTORY OF ARCHITECTURE. Lectures covering the development of architecture from its beginnings in Egypt and Mesopotamia, through Greece and Rome to the Early Christian period, touching upon the building of the Orient. First semester (3).

F.A. 4. HISTORY OF ARCHITECTURE. Continuation of F.A. 3. Romanesque and Gothic architecture, the Renaissance, and developments down to and including present day building. Second semester (3).

F.A. 5. FREEHAND DRAWING. Elementary freehand perspective, followed by drawing from still life objects in pencil, charcoal, and in the various modes: delineation, form-drawing, color-value. First semester (3).

F.A. 6. FREEHAND DRAWING. Further practice in expression; color theory with simple exercises in water color. Second semester (3).

F.A. 17. CRITICISM AND ANALYSIS OF ART. An advanced course primarily for majors. Readings, investigations, reports, conferences in regard to the works of writers on art with special reference to painting, particularly from the following men: Aristotle, Leonardo da Vinci, Winckelmann, Joshua Reynolds, Tolstoi, Lessing, Taine, Goethe, Ruskin, Whistler, Cox, Baldwin Brown, Cortissoz, John LaFarge, Clive Bell, Berenson, Barnes, Roger Fry. The attempt is made to formulate the theories of art upon which the criticisms are based as well as a study of the paintings themselves in the light of these comments. There is also an effort to distinguish the differing aims of the chief schools of art, with a chronological study of the changes which have taken place in the attitude both of artist and of the public. This is followed as time and the aptitude of the students permit by an analytical study of paintings from the compositional and interpretive points of view. Prerequisite: F.A. 1 and 2 or the ability to satisfy the instructor of one's suitable preparation in the history of fine arts. Prospective students should consult the instructor before enrolling. First semester (3).

F.A. 18. CRITICISM AND ANALYSIS OF ART. Continuation of F.A. 17. Second semester (3).

FRENCH
See **Romance Languages**

GEOLOGY

PROFESSOR B. L. MILLER, ASSISTANT PROFESSOR FRETZ,
MESSRS. WHITCOMB, FRASER, AND PEOPLES

Geol. 1. MINERALOGY. The principles of crystallography with practice in determination of forms of models and crystals; the physical properties, origin, occurrence, association, and alteration of minerals; a study of about two hundred of the common

mineral species and varieties, with practice in identification based on physical and chemical properties, including blowpipe exercises. Student should have had Chem. 1 and 11, or 3 and 13. Fee, \$5.00. First semester (4).

Geol. 1a. MINERALOGY. Similar to Geol. 1, but without blowpipe exercises. Fee \$5.00. First semester (3).

Geol. 2. BLOWPIPE ANALYSIS. A course in qualitative blowpipe analysis in which the chemical and physical behavior of the common chemical elements and their compounds is noted; methods of rapid qualitative tests for the identification of minerals and chemical compounds with the aid of the blowpipe. Student should have had Chem. 1 and 11, or 3 and 13, and 20. Fee, \$2.00. First semester (1).

Geol. 3. INTRODUCTION TO GEOLOGY. A study of geologic processes designed to furnish an introductory survey of the subject of geology. Includes a brief survey of historical geology. Text-book and lectures. Concurrent with Geol. 6. First semester (2).

Geol. 4. GENERAL GEOLOGY. A course in dynamic and structural geology. Text-book, supplemented by illustrated lectures in which the relation of geology to economic problems is discussed. Second semester (2).

Geol. 5. PETROLOGY. Macroscopic study of igneous, sedimentary, and metamorphic rocks; their origin, classification, and identification. Concurrent with Geol. 4. Prerequisite: Geol. 1 or 1a. Second semester (1).

Geol. 6. GEOLOGY LABORATORY AND FIELD TRIPS. The region affords excellent examples of varied structures and contains numerous quarries and mines where slate, cement rock, limestone, sandstone, gneiss, serpentine, iron, and zinc are or were once obtained, and gravel, sand, and clay pits. These and other geologic features are observed in the field trips. Indoor laboratory work consists of study of geological specimens and maps. Concurrent with Geol. 3 and 4. Fee, \$1.00. First and second semesters (1).

Geol. 7. NON-METALLIC ECONOMIC GEOLOGY. A study of the origin, modes of occurrence, properties, sources, production,

and uses of non-metallic mineral products. Prerequisites: Geol. 1, 3 or 4, 5, and 6, or 16 and 17. First semester (2).

Geol. 8. HISTORICAL GEOLOGY. A study of the development of the continents and life forms. A discussion of evolution based on the remains of animal and plant life preserved in the rocks. Text-book, lectures, and laboratory exercises. Prerequisite: Geol. 3 or 4, or 16 and 17. First semester (3).

Geol. 9. ENGINEERING GEOLOGY. Designed primarily for engineering students. Includes a study of selected minerals, rocks, building stones, and road materials. Applications of geology to the construction of dams, tunnels, building foundations, and highways, and to the problems of underground water conditions, flood control, etc. Two lectures and one laboratory. Prerequisites: Geol. 3 or 4, and 6. Second semester (3).

Geol. 16. PHYSIOGRAPHY. A study of the origin, history, and economic significance of topographic features, soils, and natural resources; occasional field trips and laboratory work devoted to instruction and practice in the interpretation and construction of topographic maps. First semester (3).

Geol. 17. PHYSIOGRAPHY, CONTINUED. Meteorology, climatology, oceanography, and geographical location are considered separately. This is followed by a consideration of these and other factors constituting the natural environment, in their effect upon man. Laboratory and field exercises. Prerequisite: Geol. 16, or 3 (or 4) and 6. Second semester (3).

Geol. 18. METEOROLOGY AND CLIMATOLOGY. A study of the atmosphere and its work followed by investigations of climate. One laboratory period each week is devoted to meteorological instruments, preparation and interpretation of weather maps and other meteorological data, and making forecasts. Second semester (3).

For Advanced Undergraduates and Graduates

Geol. 108. METALLIC ECONOMIC GEOLOGY. A study of the geological occurrence, distribution, uses, and commercial production of the metalliferous minerals; consideration of the most important mining districts. Recitations, illustrated lectures, field trips, and laboratory examination of ore specimens from

representative districts of North and South America and other countries; visits to the zinc mines of Franklin Furnace, N.J., and Friedensville, Pa., the magnetite mines of Dover N.J., and Cornwall, Pa., and the anthracite coal regions. Prerequisites: Geol. 1, 3 or 4, and 6. Second semester (3). Dr. Fraser.

Geol. 109. PALEONTOLOGY. The plant and animal fossils are studied mainly from the morphologic point of view; evolution of the faunas and floras. Lectures and laboratory work. Prerequisite: Geol. 3 or 4, or 16 and 17; or Biol. 1, or 7 and 8. Second semester (3). Dr. Whitcomb.

Geol. 110. STRATIGRAPHY. The principles of correlation of the sedimentary rocks based upon the conditions of sedimentation and the use of index fossils. Study in the laboratory of characteristic faunas, the geologic age, and geographic distribution and structural features of the rocks of North America. In the spring, field trips illustrating the use of sedimentary structures and faunas in the delimitation of periods and formations, and in the solution of other stratigraphic problems. For those who have not already had Geol. 8 or 109, a few weeks are devoted to a study of evolution and characteristic fossil forms. Prerequisite: Geol. 8 or 109. Second semester (2). Dr. Whitcomb.

Geol. 111. FIELD GEOLOGY. Practice in the actual mapping of surface geology, each student being assigned a definite area and required to prepare a report on the assigned area accompanied by a geological map with structure sections; collection by each student of a full set of specimens to illustrate the geology. The first part of the course devoted exclusively to field work; the notes and specimens studied in the laboratory when the weather prevents further outdoor work. Prerequisites: Geol. 3 or 4, 5, and 6. Fee, \$1.00. First semester (2). Professor Miller.

Geol. 112. PETROGRAPHY. The optical properties of minerals and their study with the petrographic microscope; petrography of the most important igneous rocks. Lectures, recitations, and laboratory work. Prerequisites: Geol. 1 and 5. Fee, \$3.00. First semester (2). Dr. Fraser.

Geol. 113. PETROLEUM GEOLOGY. Properties of petroleum and natural gas, origin, occurrence, methods employed by geolo-

gists in locating favorable localities, characteristics of domestic and foreign oil and gas fields, economics of oil industry. Prerequisites: six hours of geology. Second semester (3). Professor Miller, Dr. Fraser.

Geol. 114. STRUCTURAL GEOLOGY. The study of special features of structural geology in the field and laboratory. Prerequisites: Geol. 3 or 4, and 6. First semester (2). Dr. Fraser.

Geol. 115. GEOLOGIC METHODS. Methods used by the United States Geological Survey and by the mining companies that employ geologists; special attention to the problems that confront an economic geologist in the investigation of coal lands, oil properties, metal mines, etc. Prerequisite: Geol. 111. Second semester (2). Dr. Fraser.

Geol. 116. GEOLOGY SEMINAR. Investigations of current and classic geological literature. Assigned readings and reports. Participated in by members of the teaching staff and advanced students. First and second semesters (1). Professor Miller.

For Graduates

Geol. 220. GEOLOGICAL INVESTIGATION. The investigation and study of the literature of some special geological problem. Field and laboratory work on some district; map of a limited area; an investigation of the stratigraphic and structural features of the strata present; presentation of a thesis or dissertation embodying these results. Preparation required dependent upon the nature of the problems to be studied. Prospective students for this course should first consult the professor in charge. First semester (4). Professor Miller, Dr. Whitcomb, Dr. Fraser.

Geol. 221. GEOLOGICAL INVESTIGATION. Continuation of Geol. 220. Second semester (4). Professor Miller, Dr. Whitcomb, Dr. Fraser.

Geol. 222. ADVANCED ECONOMIC GEOLOGY. Advanced work in ore deposits. Study of the literature and of the theories of ore deposition, together with detailed work on the type occurrences of some of the metallic or non-metallic minerals; thorough investigation and report on some mining district with special regard to the origin of the ores and such commercial aspects of the deposits as may depend chiefly on the

geology: preparation and microscopic study of specimens of ores. Prerequisites: Geol. 7 and 108. First semester (3) to (6). Professor Miller, Dr. Fraser.

Geol. 223. ADVANCED ECONOMIC GEOLOGY. Continuation of Geol. 222. Second semester (3) to (6). Professor Miller, Dr. Fraser.

Geol. 224. ADVANCED PETROGRAPHY. A critical study of recent advances in petrographic methods and nomenclature; preparation of detailed report on a selected problem. Prerequisites: Geol. 1, 3 or 4, 5, and 112. Second semester (3). Dr. Fraser.

Geol. 225. ADVANCED PHYSIOGRAPHY. The detailed study of physiographic types and processes. Conferences, reports, and thesis, with work in the laboratory and field. Prerequisite: training in elementary physiography and general geology. First semester (4). Professor Miller, Dr. Whitcomb.

Geol. 226. ADVANCED PHYSIOGRAPHY. Continuation of Geol. 225. Second semester (4). Professor Miller, Dr. Whitcomb.

Geol. 227. PHYSICAL CRYSTALLOGRAPHY. An advanced course in the geometrical and physical properties of crystals with special reference to the Goldschmidt method of crystal measurement and projection. Prerequisites: Geol. 1, Phys. 6 and 7. First semester (2). Assistant Professor Fretz.

Geol. 228. CRYSTALLOGRAPHIC STRUCTURE. An advanced course in the molecular and atomic structure of metals and crystalline mineral salts and the point group system of space lattices. Assigned reading of the recent literature on the subject. Prerequisite: Geol. 1. First semester (1) or (2). Assistant Professor Fretz.

Geol. 229. COAL RESEARCH. A study of the constitution of coal, embracing a review of the literature and the preparation and microscopical examination of thin sections and polished surfaces. First and second semesters (3). Professor Miller, Dr. Fraser.

Geol. 230. ADVANCED PALEONTOLOGY. A course in which selected groups of fossils are studied in detail, emphasis being placed upon a knowledge of the literature, generic and specific differences, identification, description, and preparation of fossils. First semester (3). Dr. Whitcomb.

GERMAN

PROFESSOR PALMER, ASSOCIATE PROFESSOR MORE,
ASSISTANT PROFESSOR KEGEL, MR. MINER

Ger.1. ELEMENTARY GERMAN. First and second semesters (3).

Ger. 2. ELEMENTARY GERMAN. Continuation of Ger. 1. Prerequisite: Ger. 1 or the equivalent. Second semester (3).

Ger. 3. INTERMEDIATE GERMAN. German prose and poetry. Outside reading. Composition. Prerequisite: Ger. 2 or the equivalent. First semester (3).

Ger. 4. INTERMEDIATE GERMAN. Continuation of Ger. 3. Prerequisite: Ger. 3 or the equivalent. Second semester (3).

Ger. 7. GERMAN OF CHEMISTRY. Rapid reading of selected texts on chemistry. Prerequisite: Ger. 2 or the equivalent. First semester (3).

Ger. 9. ADVANCED GERMAN, PROSE AND POETRY. Rapid reading of representative texts; collateral reading. Prerequisite: Ger. 4 or the equivalent. First semester (3).

Ger. 10. GOETHE'S FAUST. Study of Part 1. Lectures on the origin and development of the Faust story; collateral reading. Prerequisite: Ger. 3 or 4, or the equivalent. Second semester (3).

Ger. 21. METHODS IN GERMAN. A course for prospective teachers. Advanced German grammar, German composition, conversation, methods of teaching, and discussion of textbooks. Prerequisite: Ger. 10 or the equivalent. Second semester (3).

For Advanced Undergraduates and Graduates

Ger. 111. NINETEENTH CENTURY GERMAN DRAMA. Lectures, reading, reports on assigned work. Prerequisite: Ger. 10 or the equivalent. First semester (3). Professor Palmer, Associate Professor More.

Ger. 112. NINETEENTH CENTURY GERMAN DRAMA. Continuation of Ger. 111. Second semester (3). Professor Palmer, Associate Professor More.

Ger. 113. LESSING, GOETHE, AND SCHILLER. Prerequisite: Ger. 10 or the equivalent. First semester (3). Professor Palmer.

Ger. 114. LESSING, GOETHE, AND SCHILLER. Continuation of Ger. 113. Second semester (3). Professor Palmer.

Ger. 115. THE GERMAN SHORT STORY. Origin and development. Rapid reading of illustrated stories, with particular attention to Gottfried Keller, Theodor Storm, C. F. Meyer, and Paul Heyse; lectures and reports. Prerequisite: Ger. 10 or the equivalent. First semester (3). Assistant Professor Kegel.

Ger. 116. THE GERMAN SHORT STORY. Continuation of Ger. 115. Second semester (3). Assistant Professor Kegel.

GOVERNMENT

See History and Government

GREEK

PROFESSOR GOODWIN

Gk. 1. ELEMENTARY GREEK. For freshmen and sophomores who have entered without Greek, but who desire to take up the study in college. They perform in two years approximately the amount of work required for admission from those who present Greek, and are prepared to proceed in the third year with Gk. 15. This course may, at the discretion of the department, be omitted in any year when there are fewer than six applicants. Prerequisite: None, but some knowledge of Latin is highly desirable. First semester (3).

Gk. 2. ELEMENTARY GREEK. Continuation of Gk. 1. Second semester (3).

Gk. 3. SECOND-YEAR GREEK. *Anabasis; Iliad* (if time permits); grammar and simple composition. Offered only when Gk. 1 and 2 have been given in the preceding year. Prerequisites: Gk. 1 and 2, or one year of entrance Greek. First semester (3).

Gk. 4. SECOND-YEAR GREEK. Continuation of Gk. 3. Second semester (3).

Gk. 7. THUCYDIDES. One or more books. Composition. Prerequisites: Gk. 15 and 16. First semester (3).

Gk. 8. TRAGEDY. Euripides, *Medea*, *Bacchae*, or another play. Sophocles, *Oedipus Tyrannus*, *Antigone*, or another. Literary study of the drama; poetical language, style, and conception; metrical reading; composition. Prerequisites: Gk. 15 and 16. Second semester (3).

Gk. 9. DRAMATIC POETRY (continued). Aeschylus, *Agamemnon* or *Prometheus Bound*. Aristophanes, *Clouds*, *Frogs*, or *Birds*. Aristophanes as humorist and as moralist, with consideration of the tendencies which he satirized. Metres. Elementary text-criticism. Prerequisites: Gk. 15, 16, and 8. First semester (3).

Gk. 10. GREEK ORATORY. Selections from the earlier Attic orators and Demosthenes. Rapid reading, the student being supposed to have reasonable facility in understanding the Greek directly without rendering into English. Attention is directed largely to those points which illustrate the development of Greek prose style. Prerequisites: Gk. 15 and 16. Second semester (3).

Gk. 11. HOMER. Rapid reading of considerable portions of the *Iliad* or the *Odyssey*. Homeric language, syntax, and metre reviewed with some reference to the needs of intending teachers, but chiefly as a foundation for the study outlined in Gk. 12. Prerequisites: Gk. 15 and 16. First semester (3).

Gk. 12. LYRIC POETRY. Fragments of the Elegiac, Iambic, and Melic poets; selections from Pindar or Theocritus. Prerequisites: Gk. 15, 16, and 11. Second semester (3).

Gk. 13. HELLENISTIC GREEK. *New Testament*. Selections from Lucian. To be substituted on occasion for Gk. 12. Prerequisites: Gk. 15 and 16, and the approval of the professor. Second semester (3).

Gk. 15. HOMER AND HERODOTUS. *Iliad* I.-III., or selected books of the *Odyssey*. Herodotus selections. Study of the forms and syntax of the Homeric and Ionic dialects; grammatical an-

alysis; reading aloud of Greek; sight-reading; composition. Prerequisites: Gk. 1, 2, 3, and 4, or entrance Greek. First semester (3).

Gk. 16. PLATO. *Euthyphro*, *Apology*, or other shorter dialogues. Grammar and composition as in the first semester. Prerequisite: Gk. 15. Second semester (3).

Courses Gk. 9 and 11, 10 and 12 (or 13) are offered in alternate years, and are open to both juniors and seniors.

Candidates for honors in Greek are assigned special readings on request.

For Graduates

Candidates must satisfy the professor of Greek as to their adequate preparation for advanced work. Ordinarily at least four years of Greek in college is expected as a prerequisite. The following are specimen courses, and others may be arranged. Only one course will be given in any one semester.

Gk. 201. GREEK POETRY. The development of poetry in Greece from Homer to the drama, with special study of the lyric poets, and collateral reading. First semester (3). Professor Goodwin.

Gk. 202. GREEK POETRY. Continuation of Gk. 201. Second semester (3). Professor Goodwin.

Gk. 203. GREEK PHILOSOPHY. The history of philosophic thought in Greece, particularly in the pre-Socratic period. Ritter and Preller's *Historia Philosophiae Graecae*, and collateral reading. First semester (3). Professor Goodwin.

Gk. 204. GREEK PHILOSOPHY. Continuation of Gk. 203. Second semester (3). Professor Goodwin.

Gk. 205. HELLENISTIC GREEK. Portions of the *Gospels* in a comparative study, the *Acts*, and selected *Epistles*. Chapters from the *Septuagint*. Patristic literature. Collateral reading. Selections from Lucian. First semester (3). Professor Goodwin.

Gk. 206. HELLENISTIC GREEK. Continuation of Gk. 205. Second semester (3). Professor Goodwin.

HISTORY AND GOVERNMENT

PROFESSORS GIPSON AND S. M. BROWN,
ASSOCIATE PROFESSORS HARMON AND SCHULZ

HISTORY

Hist. 7. HISTORY OF ENGLAND TO 1603. A study of early Britain, the Anglo-Saxon Heptarchy and customs, the Norman Conquest, development of parliament, continental wars, and the War of the Roses. First semester (3).

Hist. 8. HISTORY OF ENGLAND TO 1603, CONTINUED. The Tudor dynasty; the breaking-up of the mediæval economy, the Reformation, rise of the middle class, mercantilism, and the era of exploration. Prerequisite: Hist. 7. Second semester (3).

Hist. 9. HISTORY OF ENGLAND, 1603 TO DATE. The Stuarts and the Protectorate; the new social conditions; conflict between king and parliament; the Puritan Revolution; Cromwell and the protectorate. To alternate with Hist. 7. Not given in 1933-1934. First semester (3).

Hist. 10. HISTORY OF ENGLAND, 1603 TO DATE, CONTINUED. Continental policy in the eighteenth century; the coming of empire; the industrial revolution; political appearance of the cabinet; colonial expansion. Prerequisite: Hist. 9 or by permission. To alternate with Hist. 8. Not given in 1933-1934. Second semester (3).

Hist. 13. UNITED STATES HISTORY. The era of constitution-making; the evolution of political parties; foreign relations during the wars of the French revolutionary period; the western movement and western state-building; the growth of sectionalism. First semester (3).

Hist. 14. UNITED STATES HISTORY. The war for the Union; the reconstruction of the South; the era of big industry and labor combinations; the United States as a world power; the new national paternalism. Second semester (3).

Hist. 22. QUEEN ELIZABETH AND HER CONTEMPORARIES. A study of the great personalities of this period. Not given in 1933-1934. Second semester (3).

Hist. 25. EUROPEAN HISTORY. A rapid survey of the major historic forces from the collapse of the Roman Empire to the

sixteenth century. Emphasis placed upon the cultural aspects of mediæval society. First semester (3).

Hist. 26. EUROPEAN HISTORY. Continuation of Hist. 25. A more detailed account of historic developments in the eighteenth and nineteenth centuries with an attempt to set forth the more important political antecedents of the World War. Second semester (3).

Hist. 27. EUROPEAN EXPANSION AND EMPIRE-BUILDING, 1492-1820. This course consists of a study of certain aspects of the phenomenon of the spread of European civilization and empire into the continents of America, Asia, and Africa. The following topics are emphasized: the progress of discovery, exploration, and settlement; European relations with the native peoples; the evolving of the imperial systems in the sixteenth and seventeenth centuries; imperial rivalries of the eighteenth century; the disintegration of the old empires of France, Spain, and England in the eighteenth and nineteenth centuries. Not given in 1933-1934. First semester (3).

Hist. 28. EUROPEAN EXPANSION AND EMPIRE-BUILDING, 1492-1820. Continuation of Hist. 27. Not given in 1933-1934. Second semester (3).

Attention is called also to the following courses in History offered by other departments; ANCIENT HISTORY by the department of Latin; INDUSTRIAL EVOLUTION by the department of Economics and Business Administration.

For Advanced Undergraduates and Graduates

Hist. 115. THE RENAISSANCE. The decline of mediævalism; revived study of the humanities; influence on literature, art, religion, and society. A seminar course; admission by permission only. Not given in 1933-1934. First semester (3). Professor Brown.

Hist. 116. THE REFORMATION. Continuation of Hist. 115. The revolt within the church; its spread to Germany; Luther; Melanchthon; Calvin; the sixteenth century commercial revolution; nationalist tendencies. Prerequisite: Hist. 115. Not given in 1933-1934. Second semester (3). Professor Brown.

Hist. 117. THE FRENCH REVOLUTION. The precursors of the Revolution: Quesnay and the physiocrats, the "intellectuals," Montesquieu, Voltaire, Rousseau; social and financial chaos. A seminar course; admission by permission only. First semester (3). Professor Brown.

Hist. 118. THE FRENCH REVOLUTION. Continuation of Hist. 117. The Revolution: political and constitutional changes; the spirit of the Jacobins; the Reign of Terror; reactions within France and beyond the Rhine; the submersion of the Republic in the Empire. Second semester (3). Professor Brown.

Hist. 119. SEMINAR. Open to students of senior standing who desire to major in history or who have shown ability in the field of humanistic studies. A brief period of history is studied intensively. Subject for 1933-1934: "The British Empire in the Eighteenth Century." First semester (3). Professor Gipson.

Hist. 120. SEMINAR. Continuation of Hist. 119. Second semester (3). Professor Gipson.

Hist. 123. ENGLAND UNDER THE STUARTS. A course designed to give a general view of the constitutional and political development of the seventeenth century; a survey of social England. Summer session (3). Professor Brown.

Hist. 129. AMERICAN FOREIGN POLICY. The French alliance; independence and boundaries; commercial restrictions; French Revolution and neutrality; purchase of Louisiana; War of 1812; acquisition of Florida; Monroe Doctrine; relations with France and Great Britain; Oregon and Texas; the Mexican War; manifest destiny; Isthmian diplomacy; China and Japan. First semester (3). Associate Professor Harmon.

Hist. 130. AMERICAN FOREIGN POLICY. The Civil War and possible European intervention; Alaska boundary; War with Spain; the new Caribbean policies; the World War; the League of Nations; Washington Conference; the aftermath of the Great War. Second semester (3). Associate Professor Harmon.

Hist. 131. THE CULTURE OF THE MIDDLE AGES. An attempt to appreciate the fusion of the Classical, Christian, and Teutonic elements which shaped the cultural life of the Middle Ages. Particular emphasis is placed upon the daily life and habits

of men and women rather than upon political experience and military activity. Prerequisite: junior standing or the consent of the instructor. Not given in 1933-1934. First semester (3). Professor Brown.

Hist. 132. THE CULTURE OF THE MIDDLE AGES. Continuation of Hist. 131. An inquiry into feudal and peasant society; monasticism; industry and the gilds; art and architecture; amusements; food and clothing; poor and sick-relief; the theory and practice of Christianity. Prerequisite: junior standing or the consent of the instructor. Not given in 1933-1934. Second semester (3). Professor Brown.

Hist. 133. THE CULTURE OF MODERN EUROPE. A study of the cultural phases of the fifteenth, sixteenth, and seventeenth centuries with emphasis upon the social life of the people. Prerequisite: junior standing or the consent of the instructor. First semester (3). Professor Brown.

Hist. 134. THE CULTURE OF MODERN EUROPE. Continuation of Hist. 133 but dealing with such cultural phenomena as the baroque, the rococo, and rationalism. Particular attention is paid to the industrial revolution and the economic and social theories which accompanied it. Prerequisite: junior standing or the consent of the instructor. Second semester (3). Professor Brown.

Hist. 139. THE CIVIL WAR. Background of the Civil War; Buchanan's policy; Lincoln's attitude; views of Davis; Northern and Southern leaders contrasted. First semester (3). Associate Professor Harmon.

Hist. 140. RECONSTRUCTION OF THE UNION. Problems of a restored Union; the policy of Johnson; views of the North and South; radical reconstruction; the election of Grant; the Supreme Court and reconstruction; the restoration of white supremacy in the South. Second semester (3). Associate Professor Harmon.

Hist. 175. LEADING FIGURES IN EUROPEAN HISTORY. A series of biographical studies, treating of men and women in church and state from Charlemagne to Napoleon. Emphasis is cultural rather than purely historical. Summer session (3). Professor Brown.

For Graduates

Students desiring to major in history and government should have had at least twelve semester hours in connection with their undergraduate work that bear upon this field of study or in other ways should satisfy the department that they are in a position to undertake profitably the required program for the master's degree. Students should register for graduate work only after consultation with the head of the department.

Hist. 201. ENGLISH INSTITUTIONAL HISTORY. A study of political, social, economic, and religious institutions which have most profoundly influenced American civilization. Not given in 1933-1934. First semester (3). Professor Brown.

Hist. 202. ENGLISH INSTITUTIONAL HISTORY. Continuation of Hist. 201. Not given in 1933-1934. Second semester (3). Professor Brown.

Hist. 211. ENGLISH COLONIZATION IN NORTH AMERICA IN THE SEVENTEENTH CENTURY. The activities of the great overseas trading companies; the problem of proprietary control; the decline of the chartered colonies; conflicts between opposing political, economic, and religious ideals within the colonies. First semester (3). Professor Gipson.

Hist. 212. ENGLISH COLONIZATION IN NORTH AMERICA IN THE SEVENTEENTH CENTURY. Continuation of Hist. 211. Second semester (3). Professor Gipson.

Hist. 213. AMERICA IN THE EIGHTEENTH CENTURY. The workings of the English mercantile system; the evolution of colonial institutions; the international struggle for the fur trade in North America; George III and the new administrative system. Not given in 1933-1934. First semester (3). Professor Gipson.

Hist. 214. AMERICA IN THE EIGHTEENTH CENTURY. Continuation of Hist. 213. Not given in 1933-1934. Second semester (3). Professor Gipson.

Hist. 215. AMERICAN CONSTITUTIONAL HISTORY. The major problems involved in the growth of the powers of the national government. Not given in 1933-1934. First semester (3). Associate Professor Harmon.

Hist. 216. AMERICAN CONSTITUTIONAL HISTORY. Continuation of Hist. 215. Not given in 1933-1934. Second semester (3). Associate Professor Harmon.

Hist. 217. AMERICA AS A WORLD POWER. The relations of the United States with Latin America; the problem of the Pacific; the United States and Europe. Summer session (3). Associate Professor Harmon.

Hist. 218. AMERICA AS A WORLD POWER. Continuation of Hist. 217. Not given in 1933-1934. Summer session (3). Associate Professor Harmon.

Hist. 225. PENNSYLVANIA HISTORY. In this course various aspects of eighteenth century Pennsylvania history are studied such as the evolution of the institutions of government, the relations of the settlers to the proprietors, the land policy, the Indian policy, the relations of the various racial groups and religious groups toward one another and toward the provincial government, the relations of Pennsylvania and her colonial neighbors. Summer session (3). Professor Gipson.

Hist. 226. PENNSYLVANIA HISTORY. Continuation of Hist. 225. Summer session (3). Professor Gipson.

Hist. 227. RESEARCH METHODS IN THE SOCIAL SCIENCES. This course is concerned primarily with the technique of research along the lines of historical method. It includes training in the critical handling of documentary materials, in measuring the value of evidence, and in formal presentation of the results of research. Required of all graduate students in history and government. Open to seniors by permission. Not given in 1933-1934. First semester (3). Professor Gipson, Professor Brown.

Hist. 228. RESEARCH METHODS IN THE SOCIAL SCIENCES. Continuation of Hist. 227. Not given in 1933-1934. Second semester (3). Professor Gipson, Professor Brown.

GOVERNMENT

Govt. 41. NINETEENTH AND TWENTIETH CENTURY DIPLOMACY. The expansion of the leading European nations in the direction of the economic and political mastery of Africa and Asia. The development of conflicting imperialistic systems and the

creation of alliances for the maintenance of the balance of power. Prerequisite: junior standing or the consent of the instructor. First semester (3).

Govt. 42. THE WORLD WAR AND ITS AFTERMATH. The causes of the war, the chief areas of conflict, the causes for the collapse of the central powers, the peace of Versailles and the problem of world reconstruction. Prerequisite: junior standing or the consent of the instructor. Second semester (3).

Govt. 51. AMERICAN GOVERNMENT (NATIONAL). The evolution of the constitution; distribution of powers between the national government and the states; citizenship; nomination, election, and powers of the President; the machinery of legislation; the courts and the constitution. First semester (3).

Govt. 52. AMERICAN GOVERNMENT (STATE). The position of the states in the union; state constitutions; the executive, legislative, and judicial branches of state government; current criticisms and suggested reforms; instruments of popular control; the various forms of local government. Second semester (3).

Attention is also called to the courses in **ROMAN LAW** and **ROMAN POLITICAL INSTITUTIONS** offered by the department of Latin.

For Advanced Undergraduates and Graduates

Govt. 157. PROBLEMS OF MUNICIPAL MANAGEMENT. A study of the various factors involved in the efficient conduct of city government. Special emphasis given to the working of the city manager type of government. First semester (3). Associate Professor Schulz.

Govt. 158. PROBLEMS OF MUNICIPAL MANAGEMENT. Examination of the fundamental principles of effective administration; a survey of such municipal problems as city planning, health control, urban transportation, police and fire protection, water supply, and waste collection and disposal. Second semester (3). Associate Professor Schulz.

Govt. 161. INTERNATIONAL LAW. Consideration of the rules governing the conduct of states in their relations with one another in time of peace. Prerequisite: junior standing or the

consent of the instructor. Not given in 1933-1934. First semester (3). Associate Professor Schulz.

Govt. 162. INTERNATIONAL LAW. Continuation of Govt. 161. With regard to the relations between states in the event of war. Prerequisite: junior standing or the consent of the instructor. Not given in 1933-1934. Second semester (3). Associate Professor Schulz.

Govt. 163. PROBLEMS IN POLITICAL AUTHORITY. Analysis of the basic concepts of political science: state, government, sovereignty, law, liberty, rights; consideration of monarchy, aristocracy, democracy, and the presidential and cabinet plans of government. Prerequisite: junior standing. First semester (3). Associate Professor Schulz.

Govt. 164. PROBLEMS IN POLITICAL AUTHORITY. Study of the various theories concerning the proper rôle of the State in society and the ethical justification of political coercion. An examination of the political aspects of anarchism, communism, socialism, Fascism, and political pluralism. Prerequisite: junior standing. Second semester (3). Associate Professor Schulz.

ITALIAN

See Romance Languages

INDUSTRIAL ENGINEERING

See Mechanical Engineering

JOURNALISM

See English

LATIN

PROFESSOR WRIGHT,

ASSOCIATE PROFESSOR E. L. CRUM, MR. R. H. CRUM

Lat. 1a. For freshmen who enter with four years of high-school Latin. PLINY, selected letters. CICERO, selected letters. Development of letter writing among the Romans and its influence on modern literature. First semester (3).

Lat. 1b. For freshmen who elect the course after three years of high-school Latin. VERGIL. *Bucolics* and the *Aeneid* I-VI, or selections from OVID. Practice in reading aloud and scansion; training in sight translation; some study of the mythology and religion of Greece and Rome; the influence of Latin poetry upon English literature emphasized. First semester (3).

Lat. 2. HORACE. Selected *Odes*. Lectures on the history and development of lyric poetry; constant practice in reading the more important lyric metres; memorizing of stanzas and passages from Horace. Second semester (3).

Lat. 4. LIVY. Selections from the earlier books. Some study of early Roman history and topography. CATULLUS, selected poems. Prerequisites: Lat. 1 and 2. First or second semester (3).

Lat. 10. THE TEACHING OF HIGH SCHOOL LATIN. Discussion of aims, content, and methods, and of the standard texts used in preparatory school Latin, with a consideration of the report of The Classical Investigation, of Lodge's *Vocabulary of High School Latin*, and of Byrne's *Syntax of High School Latin*. Students preparing to teach Latin are expected to elect this course. Prerequisites: Lat. 4 and 13. First or second semester (3).

Lat. 11. ENGLISH WORDS DERIVED FROM THE LATIN. A course intended to give the student some familiarity with those Latin words that have contributed most largely in derivatives to the English language and to teach the intelligent use of the English dictionary. Elective for all students; no previous knowledge of Latin required. First semester (3).

Lat. 13. LATIN DRAMA. A study of drama among the Romans; native dramatic performances; indebtedness to Greek drama; the various dramatic forms and their vogue; chief writers; dramatic festivals; the Roman theatre; influences in later literature. Reading of selected plays of Plautus, Terence, and Seneca. Prerequisites: Lat. 1 and 2. First or second semester (3).

Lat. 21. ANCIENT HISTORY. A survey of the development of civilization from Paleolithic times to the world empire of Alexander the Great. The first six weeks are assigned to the Stone Ages, the Oriental nations, and the Minoan civilization;

the remainder of the semester to Hellenic Greece. In conjunction with an outline of political history, the social, economic, religious, philosophic, artistic, and literary development of the ancient world is stressed, as well as the origin of political institutions. First semester (3).

Lat. 22. ANCIENT HISTORY. Continuation of Lat. 21. The Hellenistic Age. Rome from its origin to 395 A.D. Second semester (3).

Lat. 23. ROMAN LAW. Preliminary lectures on laws and customs of peoples anterior to the rise of Roman law. A study of the development of Roman law from the *Leges Regiae* to the codification by Justinian. Readings and discussions of select portions of the law comparing them with modern law. Some time is given to the influence of Roman law on modern nations. Open to sophomores, juniors, and seniors. Second semester (3).

Lat. 24. ROMAN POLITICAL INSTITUTIONS. A course dealing with the political institutions established and developed at Rome from the earliest times down to the reign of Diocletian. A descriptive and historical survey of political life at Rome and in its provinces by means of lectures, assigned readings, and special reports. Some consideration of titles and the duties of the state officials during the regal period, the republic, and the empire. Open to sophomores, juniors, and seniors. First semester (3).

Lat. 31. BEGINNING LATIN. Special emphasis on English derivatives and the principles of grammar. Not given in 1933-1934. First semester (3).

Lat. 32. CAESAR. *The Gallic War*. Books I-IV. Prose composition and syntax. Not given in 1933-1934. Second semester (3).

Lat. 33. CAESAR. One or two of the later books of the *Gallic War* or selections from the *Civil War*. Prose composition and syntax, with special emphasis on clause construction. A course designed for students who enter with two years of high school Latin and who elect to continue Latin. First semester (3).

Lat. 34. CICERO. Orations. Continuation of Lat. 33. Essays: *de Senectute* or *de Amicitia*. Second semester (3).

For Advanced Undergraduates and Graduates

Lat. 105. SATIRE. Selected satires of Horace and Juvenal. Lectures on the history of Roman satire and its influence on modern literature. Study of social conditions under the empire. Prerequisites: Lat. 13 and 4. Not given in 1933-1934. First semester (3). Professor Wright.

Lat. 106. ROMAN PROSE WRITERS OF THE EMPIRE. Selections from the following: Petronius, *Cena Trimalchionis*; Apuleius, Cupid and Psyche story from the *Metamorphoses*; Suetonius, *Lives*; Seneca, *Moral Epistles* and *Dialogues*; Tacitus, *Germany*. Prerequisites: Lat. 13 and 4. Not given in 1933-1934. Second semester (3). Mr. Crum.

Lat. 107. VERGIL. *Aeneid*, Books VII-XII. Continuation of Lat. 108. Prerequisites: Lat. 13 and 4. Not given in 1932-1933. First semester (3). Professor Wright.

Lat. 108. LUCRETIUS. The finest literary passages and selected passages illustrating his philosophy. ENNIUS and some study of early Roman epic. VERGIL's sixth *Aeneid*. An intensive study of its debt to Greek literature, religion, and philosophy, and its influence on modern literature. Lectures on the history of the epic; collateral reading in the great epics of other literatures. Prerequisites: Lat. 13 and 4. Not given in 1932-1933. Second semester (3). Professor Wright.

Lat. 109. LATIN PROSE COMPOSITION. Exercises in translating from English into Latin with a collateral study of Latin grammar. Special attention to clause construction and other points of syntax. Students preparing to teach Latin are expected to elect this course. Prerequisites: Lat. 13 and 4. Not given in 1932-1933. First or second semester (3). Associate Professor Crum.

Lat. 121. THE ROMAN REPUBLIC. Special emphasis on governmental and social problems of the last two centuries B. C. and the Hellenistic Greek background of the Roman Empire. Given in 1934-1935. Prerequisites: Lat. 21 and 22 or approval of the head of the department. First semester (3). Professor Wright, Assistant Professor Crum, Mr. Crum.

Lat. 122. THE ROMAN EMPIRE TO THE DEATH OF MARCUS AURELIUS. Special emphasis upon the development of the

principate, and upon the social and economic structure of Rome, the provinces, and the municipalities. Given in 1934-1935. Prerequisites: Lat. 21 and 22, and 121, or approval of the head of the department. Second semester (3). Professor Wright, Associate Professor Crum, Mr. Crum.

Lat. 125. **LATIN LITERATURE IN ENGLISH TRANSLATION.** In this course the student undertakes a study of Latin literature by means of the best English translations. No knowledge of the Latin language is required. The lives of the most important authors are studied and their works read according to the major departments of literature,—history, comedy, epic, lyric, etc. At the same time emphasis is placed on the chronological development of the literature and the historical background necessary to the interpretation of the author's works. Lectures and readings with special reports. Prerequisite: junior standing or consent of the head of the department. First or second semester (3). Associate Professor Crum.

Lat. 127. **THE AENEID OF VERGIL IN ENGLISH TRANSLATION.** Reading of the entire poem with wide reading in the modern critical literature. Lectures and reports dealing with Vergil's philosophy, technique, sources, and influence on posterity. Summer session (3). Professor Wright.

For Graduates

For admission to graduate courses the student must satisfy the department of his fitness and adequate preparation. It is generally preferred that applicants have completed twenty-four semester hours of undergraduate college Latin in an approved college or university.

Lat. 200. **LATIN PALAEOGRAPHY.** History of Latin palaeography from the earliest known Latin writings, tracing the progressive changes in the formation of the letters and methods of writing up to and including the national hands. Extensive practice in reading manuscripts and facsimiles. First semester (3). Given in 1932-1933. Associate Professor Crum.

Lat. 201. **LATIN EPIGRAPHY.** Text book supplemented by frequent use of the *Corpus Inscriptionum Latinarum* and the standard texts of some of the longer inscriptions, illustrating Roman political institutions, public and private life, and re-

ligion. Given in 1933-1934. First semester (3). Professor Crum.

Lat. 202. TOPOGRAPHY AND MONUMENTS OF ANCIENT ROME. Lectures (usually illustrated) on the origin, growth, and destruction of ancient Rome and on modern methods of identifying extant monuments. Frequent reports based on a detailed study of the discoveries affecting individual sites. Given in 1933-1934. Second semester (3). Professor Wright.

Lat. 203. OVID'S *FASTI*. Substantially the whole of the *Fasti*. Lectures on the religion of ancient Rome and numerous reports on the various festivals treated in Ovid's poem and its sources. Given in 1932-1933. Second semester (3). Professor Wright.

Lat. 205. ROMAN EPIC. Lectures on the history of epic poetry. Intensive study of the *Aeneid* of Vergil and its sources. First semester (3). Associate Professor Crum.

Lat. 206. ROMAN EPIC. Continuation of Lat. 205, including later Roman epic writers. Second semester (3). Associate Professor Crum.

MATHEMATICS AND ASTRONOMY

PROFESSORS FORT, OGBURN, REYNOLDS, AND SMAIL, ASSOCIATE

PROFESSORS STOCKER AND LAMSON, ASSISTANT PROFESSORS

SHOOK AND RAYNOR, MESSRS. VAN ARNAM, BEALE, CUTLER,

CAIRNS, LATSHAW, SWAIN, FREEHAFER, AND COLEMAN

The major in mathematics in the College of Arts and Science consists in all of at least twenty-four semester hours college credit in mathematics. It must include Math. 1, 2 (or 1a, 2a,) 3, 4, 5, 6, and 16, except that a student who has entrance credit in plane trigonometry does not take Math. 1, a student who has entrance credit in advanced algebra does not take Math. 2, and a student who has entrance credit in solid geometry does not take Math. 16. The twelve hours advanced credit required by the regulations of the College must be from mathematics courses given at Lehigh University other than Math. 15, 16, 1, 1a, 2, 2a, 3, and 4.

The major in mathematics and astronomy consists of at least twenty-four semester hours college credit in mathematics and astronomy. It must include Math. 1, 2, (or 1a, 2a), 3, 4, and 5 and Astr. 2 and 3, except that students having entrance credit in plane trigonometry or advanced algebra or solid geometry do not take Math. 1 or 2 or 16 as above. The twelve hours advanced credit required shall not include Math. 15, 16, 1, 1a, 2, 2a, 3, 4, or Astr. 1.

A student entering the freshman class in the College of Engineering normally takes Math. 2. If, however, he presents advanced algebra for entrance credit he enters Math. 3, substituting for Math. 2 at some time a mathematics course for which he has the prerequisites or some other free elective.

A placement examination is given each year during freshman week to all freshmen who present plane trigonometry and solid geometry for entrance. Students who do not make a reasonable showing on this examination are required to take Math. 0 instead of Math. 2.

MATHEMATICS

Math. 0. GENERAL REVIEW COURSE IN SECONDARY SCHOOL MATHEMATICS. Topics in algebra, geometry, and trigonometry are treated. Recitations and conferences. No college credit. First and second semesters.

Math. 1. PLANE TRIGONOMETRY. First and second semesters (3).

Math. 1a. UNIFIED MATHEMATICS. This course is designed for freshmen in the College of Arts and Science. First and second semesters (3).

Math. 2. ALGEBRA. Beginning with the theory of quadratic equations. Prerequisite: Math. 1 or entrance credit in plane trigonometry. First and second semesters (3).

Math. 2a. UNIFIED MATHEMATICS. Continuation of Math. 1a. Prerequisite: Math. 1a. First and second semesters (3).

Math. 3. ANALYTIC GEOMETRY. The usual elementary course treating among other things the straight line, the conic sections, and some three-dimensional geometry. A beginning is made in the study of calculus. Prerequisite: Math. 2. First and second semesters (3).

Math. 4. ELEMENTARY CALCULUS. The formal rules of differentiation and of integration with simple applications. Prerequisite: Math. 3. First and second semesters (3).

Math. 5. INTERMEDIATE CALCULUS. Lengths, areas, and volumes of figures of revolution; double and triple integrals, centers of gravity, moments of inertia, etc. Prerequisite: Math. 4. First and second semesters (3).

Math. 6. ADVANCED CALCULUS. Taylor's Theorem in several variables, line and surface integrals, etc.; elementary differential equations. Prerequisite: Math. 5. First and second semesters (3).

Math. 15. READING COURSE IN MATHEMATICS. Credit not to exceed one hour per semester, total credit not to exceed three hours; approval of program and written report required.

Math. 16. SOLID AND SPHERICAL GEOMETRY AND SPHERICAL TRIGONOMETRY. Open to all students, particularly advised for students of astronomy. First and second semesters (3).

Math. 20. ELEMENTARY MECHANICS. Composition and resolution of forces, conditions of equilibrium for rigid bodies, friction, work, elementary kinematics and kinetics. Prerequisite: Math. 1. First and second semesters (4).

Math. 21. ANALYTIC MECHANICS. Differential equations of motion, treatment of forces in space, free and constrained motion of a particle and of masses, with applications to practical problems. Prerequisite: Math. 6. First and second semesters (3).

Math. 41. MATHEMATICS OF FINANCE. Annuities, sinking funds, amortization, etc. Prerequisite: Math. 2 or 2a. First semester (3).

Math. 42. MATHEMATICS OF STATISTICS. Prerequisite: Math. 2 or 2a. Second semester (3).

Math. 43. FIRST COURSE IN MATHEMATICS OF LIFE INSURANCE. Mathematical theory of life contingency; preparation of life and monetary tables; computation of premiums for various life insurance policies; valuation of policies to meet statutory requirements; mathematical theory of risk and cost of insurance; computation of items for annual reports; valuation of

life annuities; computation of periodic premium for various life annuities. Prerequisite: Math. 41. First semester (3).

Math. 51. ADVANCED ALGEBRA. Complex numbers, theory of equations with applications to classical problems, Sturm's theorem, etc., determinants and the theory of resultants. Prerequisite: Math. 2 or 2a. First or second semester (3).

Math. 52. PROJECTIVE GEOMETRY. Fundamental ideas and theorems of this great geometric method. Prerequisite: Math. 3. First or second semester (3).

Math. 53. SECOND COURSE IN ANALYTIC GEOMETRY. More complete treatment of conic sections and higher plane curves than is possible in Math. 3. Additional work on solid analytic geometry. First or second semester (3).

For Advanced Undergraduates and Graduates

Math. 101. VECTOR ANALYSIS. The theory and methods of vector analysis as applied in physics and pure mathematics. Prerequisite: Math. 6. First semester (3). Dr. Latshaw.

Math. 111. ADVANCED DIFFERENTIAL EQUATIONS. Special solvable nonlinear equations, linear equations, transformations and symbolic methods, solutions in series, Riccati's, Bessel's, and Legendre's equations, partial differential equations. Prerequisite: Math. 6. First semester (3). Assistant Professor Shook.

Math. 112. ADVANCED DIFFERENTIAL EQUATIONS. Continuation of Math. 111. Fourier series, cylindrical and spherical harmonics. Second semester (3). Assistant Professor Shook.

Math. 122. ADVANCED ANALYTIC MECHANICS. Prerequisite: Math. 21. First semester (3). Assistant Professor Raynor.

Math. 123. ADVANCED ANALYTIC MECHANICS. Continuation of Math. 122. Second semester (3). Assistant Professor Raynor.

Math. 124. THEORY OF ERRORS AND LEAST SQUARES AND EMPIRICAL FORMULAS. Probability and its relation to precision, development of the theory of least squares and its application in the study of errors, the formation of empirical formulas from given data. Designed for students engaged in experimental or observational work. Prerequisite: Math. 6. Second semester (3). Professor Ogburn.

For Graduates

To major in the department of Mathematics and Astronomy and obtain a master's degree in one year, a graduate student must present evidence of having completed the equivalent of the work required in this department of graduates of the College of Arts and Science who majored in mathematics or mathematics and astronomy. Graduate students who cannot satisfy these requirements but who desire to major in mathematics or mathematics and astronomy may take preliminary courses for which they are prepared, but cannot expect to complete the requirements for a master's degree in one year.

Math. 200. FUNDAMENTAL CONCEPTS OF MATHEMATICS. (3). Professor Fort.

Math. 209. MATHEMATICS SEMINAR. Reports on special topics of the literature of mathematics and of individual research. Prerequisite: graduate standing and consent of the instructor. (3). Professor Fort, Professor Reynolds, Professor Smail, or Associate Professor Lamson.

Math. 210. MATHEMATICS SEMINAR. Continuation of Math. 209. (3). Professor Fort, Professor Reynolds, Professor Smail, or Associate Professor Lamson.

Math. 211. INFINITE PROCESSES. Fundamental limit notions applied to various infinite processes. (3). Professor Fort or Professor Smail.

Math. 212. INFINITE PROCESSES. Continuation of Math. 211. (3). Professor Fort or Professor Smail.

Math. 215. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE. (3). Professor Fort or Professor Smail.

Math. 216 THEORY OF FUNCTIONS OF A COMPLEX VARIABLE. Continuation of Math. 215. Prerequisite: Math. 215. (3). Professor Fort or Professor Smail.

Math. 217. THEORY OF ELASTICITY. Theory of stress and strain. Tension and thrust with applications. Bending of rods and plates. Equilibrium of curved rods, cylinders, and spheres. (3). Professor Reynolds.

Math. 218. THEORY OF ELASTICITY. Continuation of Math. 217. (3). Professor Reynolds.

Math. 219. SELECTED TOPICS IN QUANTUM MECHANICS AND RELATIVITY. Newton's equations; Lagrange's equations; Hamilton's equations; Hamilton's partial differential equation; the wave equation of optics; Schrödinger's work, with incidental introduction of characteristic functions of second order ordinary differential equations; the hydrogen atom in the normal state and perturbed state; the theory of the Stark-effect in the new mechanics; the work of Dirac and others. The relativity part of the course is of the conventional type. (3). Associate Professor Lamson.

Math. 220. SELECTED TOPICS IN QUANTUM MECHANICS AND RELATIVITY. Continuation of Math 219. (3). Associate Professor Lamson.

Math. 221. AERODYNAMICS. Introduction to hydrodynamics, equations of motion, Bernoulli's theorem, steady flow around obstacles, vortex theory. Application to wing and propeller theories, lift and drag; dynamics of the airplane, stability and control. Prerequisite: Math. 21. First semester (3). Assistant Professor Shook.

Math. 222. AERODYNAMICS. Continuation of Math. 221. Second semester (3). Assistant Professor Shook.

Math. 223. DIFFERENTIAL GEOMETRY. The differential geometry of curves and surfaces. Prerequisite: Math. 6. First semester (3). Dr. Cutler.

Math. 224. DIFFERENTIAL GEOMETRY. Continuation of Math. 223. The differential geometry of surfaces and Riemann spaces; tensor analysis. Second semester (3). Dr. Cutler.

Math. 225. OPERATIONAL CALCULUS. The classical method of solution of the differential equations of the type used in the electric circuit theory; various proofs of the superposition theorem, of the infinite integral theorem, and of the Heaviside expansion theorem; approximate methods; operators, their interpretation and application of a theorem of Borel; applications of the Fourier integral and transforms; fractional-order derivatives; series expansions of operators; Volterra's theorem; asymptotic series; Wiener's applications of a generalized Fourier integral to operational calculus; Paul Levy's treatment. Numerous applications to electric circuit problems are

stressed throughout the course. Prerequisite: Math. 111. One semester (3). Dr. Cairns.

ASTRONOMY

Astr. 1. DESCRIPTIVE ASTRONOMY. An elementary course, open to all students. May not be substituted for Astr. 2. Second semester (3).

Astr. 2. GENERAL ASTRONOMY. (a) The solar system, the sidereal system; two hours a week. (b) Practical work in the observatory, acquiring facility in use of instruments in actual astronomical observation; one hour a week. (c) Conference. Preparation for (b) and interpreting results, study of star charts and stellar spectra; one hour a week. First semester (3).

Astr. 3. PRACTICAL ASTRONOMY. Instruments used; methods of taking and reducing observations to determine time, latitude, and azimuth; observatory work in which each student makes his own observations and computations in illustration of the theory studied. Prerequisites: Astr. 2 and Math. 5. Second semester (3).

For Graduates

Astr. 201. ASTRONOMY SEMINAR. The mathematical theory of instruments and methods used in the determination of time, latitude, longitude, and azimuth; practical work in the observatory, to give facility in making and reducing observations. Prerequisite: Astr. 3. (3). Professor Ogburn.

Astr. 202. ASTRONOMY SEMINAR. Continuation of Astr. 201. (3). Professor Ogburn.

MECHANICAL ENGINEERING AND INDUSTRIAL ENGINEERING

PROFESSORS F. V. LARKIN, KLEIN, BUTTERFIELD, AND STUART,

ASSISTANT PROFESSORS JENNINGS AND LUCE,

MESSRS. CONNELLY AND THOM

MECHANICAL ENGINEERING

M.E. 1. ELEMENTARY MACHINE DESIGN. Application of the principles of statics and elasticity to the design of power transmission machinery. Some graphical solutions and detailing on the drawing board. Prerequisite: C.E. 1. First and second semesters (3).

M.E. 2. ELEMENTARY HEAT ENGINES. Fuels, combustion, steam boilers and furnaces, properties of steam, power plant auxiliaries, heat engine cycles, steam engines, steam turbines, internal combustion engines. Prerequisites: Chem. 1, Phys. 1. First semester (3).

M.E. 4. ELEMENTARY MACHINE DESIGN. Continuation of M.E. 1. Prerequisite: C.E. 1. Second semester (3).

M.E. 5. HEAT ENGINES. Continuation of M.E. 2. Prerequisites: Chem. 1, Phys. 1. Second semester (3).

M.E. 6. MECHANISM. A study of the kinematic relations of machine parts. Determination of the relative motion of links in a mechanism; development of cams, gears, and transmission machinery from the standpoint of motion only; practical problems developed in the drawing room. Also a study of force relations in simple machines; the determination of certain forces when others are given; the determination of efficiencies carried on in the drawing room by means of a series of previously prepared plates. Prerequisite: Math. 20. Second semester (4).

M.E. 9. ENGINEERING LABORATORY. Use and calibration of instruments; elementary tests on steam engines, pumps, and boilers. Prerequisite: M.E. 2. Fee, \$3.50. First semester (1).

M.E. 10. THERMODYNAMICS. Principles of engineering thermodynamics. Energy equations, entropy, properties of steam and gases, flow of fluids. Application of principles to practical problems. Prerequisite: M.E. 2 or equivalent. First and second semesters (3).

M.E. 11. ENGINEERING LABORATORY. Continuation of M.E. 9. Laboratory experiments on flow of fluids, tests of steam engines, turbines, air compressors, heat transfer equipment, internal combustion engines. Prerequisite: M.E. 2. Fee, \$3.50. Second semester (1).

M.E. 15. THESIS. Candidates for the degree of B.S. in M.E. may, with the approval of the department, undertake a thesis as a portion of the work during the second semester of the senior year. Prerequisites: C.E. 9, M.E. 10. Second semester (3).

M.E. 19. ENGINEERING LABORATORY. A one semester course for non-mechanical students, covering principles of measurements, tests of boilers, steam engines, steam turbines, air compressors, internal combustion engines. Prerequisite: M.E. 22, 29, or equivalent. Fee, \$3.50. First and second semesters (1).

M.E. 21. ENGINEERING LABORATORY. For non-mechanical students. Use and calibration of instruments, tests of steam engines, steam turbines, boilers, air compressors, internal combustion engines, pumping equipment. Prerequisite: M.E. 22 or equivalent. Fee, \$3.50. First semester (1).

M.E. 22. HEAT ENGINES. For non-mechanical students. Fuels, combustion, properties of steam, steam power plant equipment and cycles, internal combustion engines. Prerequisites: Chem. 1, Phys. 1. First semester (3).

M.E. 23. HEAT ENGINES. Continuation of M.E. 22. Prerequisites: Chem. 1, Phys. 1. Second semester (3).

M.E. 24. ENGINEERING LABORATORY. Use and calibration of instruments, tests of heat transfer apparatus, prime movers, refrigeration machinery and power plants in the neighborhood. Prerequisite: M.E. 29 or equivalent. Fee, \$3.50. Summer session: eight hours of laboratory work each week-day for four weeks. Tuition fee, \$40.00. (4).

M.E. 25. ENGINEERING LABORATORY. Continuation of M.E. 21. Prerequisite: M.E. 22 or equivalent. Fee, \$3.50. Second semester (1).

M.E. 29. HEAT ENGINES. A one semester course for non-mechanical students. Combustion, properties of steam, power plant equipment, internal combustion engines. Prerequisites: Chem. 1, Phys. 1. First and second semesters (3).

M.E. 30. MECHANISM. A study of the kinematic relations of machine parts. Determination of the relative motion of links in a mechanism; development of cams, gears, and transmission machinery from the standpoint of motion only; practical problems developed in the drawing room. Prerequisite: Math. 20. First semester (3).

M.E. 31. APPLIED MECHANICS. Kinematics, kinetics, and elasticity in the design of machine elements. Prerequisite: M.E. 1. Not given in 1933-1934. First and second semesters (3).

M.E. 32. APPLIED MECHANICS. Continuation of M.E. 31. Application of fundamental principles in the design of a complete machine. Prerequisite: M.E. 4. Not given in 1933-1934. Second semester (3).

M.E. 33. THERMODYNAMICS. Principles of engineering thermodynamics. Energy equations, entropy, properties of steam and gases, flow of fluids. Application of principles to practical problems. Prerequisite: M.E. 2 or equivalent. Not given in 1933-1934. First and second semesters (2).

M.E. 34. THERMODYNAMICS. Continuation of M.E. 33. Power plant cycles, steam engines and turbines, compressors, refrigeration, internal combustion engines. Prerequisite: M.E. 2 or equivalent. Not given in 1933-1934. First and second semesters (2).

For Advanced Undergraduates and Graduates

Graduate students desiring to take the following courses should present as prerequisites: integral calculus, mechanics of materials, and elementary heat engines.

M.E. 108. HEAT ENGINES. Continuation of M.E. 10. Thermodynamic analyses of the following: power plant cycles, steam engine, combustion, compressors, steam turbine, internal combustion engine, refrigeration. Prerequisite: M.E. 2 or equivalent. Second semester (3). Professor Klein, Assistant Professor Jennings.

M.E. 112. ADVANCED MACHINE DESIGN. The design of machines in general with special attention to the application of underlying fundamentals in strength to specific problems, practical considerations, and the use of standards. Problems covering such machines as hoists, machine tools, hydraulic machines, etc., are worked in a drawing room conducted on the lines of a modern commercial drafting room. Prerequisites: M.E. 4, C.E. 9. First semester (4). Assistant Professor Luce.

M.E. 113. MECHANICAL ENGINEERING. Advanced work in internal combustion engines, steam turbines, with typical problems. Prerequisite: M.E. 10. First semester (3). Professor Klein, Professor Butterfield.

M.E. 114. ENGINEERING LABORATORY. Comprehensive tests of power plant equipment, internal combustion engines, refrigeration machinery. Prerequisite: M.E. 9. Fee, \$3.50. First semester (2). Professor Stuart, Assistant Professor Jennings.

M.E. 116. ADVANCED MACHINE DESIGN. Continuation of M.E. 112, with special emphasis on the effect of eccentric loading and inertia forces on the dimensions of machine parts. Prerequisites: M.E. 4, C.E. 9. Second semester (4). Assistant Professor Luce.

M.E. 117. MECHANICAL ENGINEERING. Continuation of M.E. 113. Advanced work in refrigeration, heating, ventilation, and power plant design. Prerequisite: M.E. 10. Second semester (3). Professor Klein, Professor Butterfield.

M.E. 118. ENGINEERING LABORATORY. Continuation of M.E. 114 supplemented by complete tests of power plants in the vicinity and original investigations. Prerequisite: M.E. 9. Fee, \$3.50. Second semester (2). Professor Stuart, Assistant Professor Jennings.

Students taking any of the courses in engineering laboratory are subject to call for one twenty-four hour test a semester.

M.E. 119. GENERAL AERONAUTICS. A theoretical course in aerostatics, aerodynamics, aeronautical power plants, and aeronautical navigating instruments. Prerequisite: senior standing in the college of engineering. First semester (3). Professor Butterfield.

M.E. 120. GENERAL AERONAUTICS. Continuation of M.E. 119 with same prerequisite. Second semester (3). Professor Butterfield.

M.E. 121. ADVANCED MACHINE DESIGN. Commercial design methods and procedure in the development of machines for unit manufacture and quantity production. Prerequisite: M.E. 31, C.E. 17. Not given in 1933-1934. First semester (3). Assistant Professor Luce.

M.E. 122. ADVANCED MACHINE DESIGN. Design problems involving dynamics and elasticity; emphasis upon analysis. Prerequisites: M.E. 31, C.E. 17. Not given in 1933-1934. Second semester (3). Assistant Professor Luce.

For Graduates

Math. 217 and 218, Theory of Elasticity, and Math. 221 and 222, Aerodynamics, may be included in a graduate major in mechanical engineering.

M.E. 200. ADVANCED ENGINEERING THERMODYNAMICS. Energy equations; availability and entropy; general equations; formulation of vapor properties; action of steam in nozzles and turbines; supersaturation; gas properties; gas reactions in combustion. Prerequisite: graduate standing in engineering. First semester (3). Professor Klein or Professor Stuart.

M.E. 201. ADVANCED ENGINEERING THERMODYNAMICS. Continuation of M.E. 200. Second semester (3). Professor Klein or Professor Stuart.

M.E. 203. INTERNAL COMBUSTION ENGINES. History; laws of mixing, carburation, atomization, combustion, and chemical equilibrium; heat losses; friction losses; governing; gas engine cycles; vibration and balancing; engine types. Prerequisite: M.E. 10. First semester (3). Professor Butterfield.

M.E. 204. INTERNAL COMBUSTION ENGINES. Continuation of M.E. 203. Second semester (3). Professor Butterfield.

M.E. 207. STEAM TURBINES. Theory of the steam turbine; classification; discussion of types; operation and governing; principles underlying the design of turbine parts; critical velocities. Prerequisite: graduate standing in engineering. First semester (3). Professor Klein.

M.E. 208. STEAM TURBINES. Continuation of M.E. 207. Prerequisite: graduate standing in engineering. Second semester (3). Professor Klein.

M.E. 211. ADVANCED ENGINEERING LABORATORY. Original investigations and advanced testing in the field of mechanical engineering preceded by a study of the methods of precision measurements required. Prerequisite: graduate standing in engineering, M.E. 9 and 10 or equivalents. Fee, \$3.50. First semester (3). Professor Stuart or Assistant Professor Jennings.

M.E. 212. ADVANCED ENGINEERING LABORATORY. Continuation of M.E. 211. Fee, \$3.50. Second semester (3). Professor Stuart or Assistant Professor Jennings.

INDUSTRIAL ENGINEERING

I.E. 1. INDUSTRIAL EMPLOYMENT. Following the junior year, students are required to do a minimum of eight weeks of practical work, preferably as student apprentices, in the work they plan to follow after graduation. A report, typewritten and bound, is required. Prerequisite: sophomore standing.

I.E. 2. INDUSTRIAL MANAGEMENT. A course in the essential problems of organization, financial administration, plant layout, production control, and employment policies of industrial enterprises. Prerequisites: Bus. 3 and 4. First semester (3).

I.E. 3. INDUSTRIAL MANAGEMENT. Continuation of I.E. 2. Prerequisites: Bus. 3 and 4. Second semester (3).

In I.E. 2 and I.E. 3 a maximum of three half-day inspection trips a semester is required.

I.E. 4. INDUSTRIAL POWER. Application of the principles of thermodynamics to the design and operation of steam power plants, internal combustion engines, compressors, and refrigeration. One afternoon period weekly devoted to engineering laboratory and inspection and tests of plants in the vicinity of the University. Prerequisites: Math. 5, M.E. 10. Second semester (3).

I.E. 5. THESIS. Candidates for the degree of B.S. in Industrial Engineering may, with the approval of the department, undertake a thesis as a portion of the work of the second semester of the senior year. Prerequisites: C.E. 9, Bus. 11. Second semester (3).

METALLURGICAL ENGINEERING

PROFESSOR STOUGHTON, ASSOCIATE PROFESSORS BUTTS AND DOAN,
ASSISTANT PROFESSOR HARVEY

Met. 1. GENERAL METALLURGY. A course of lectures discussing the metallurgical application of physics, chemistry, and economics, and the basic principles and apparatus employed in metallurgical operations. Ores, fuels, combustion, pyrometry, refractories, furnaces, metallurgical processes and products, metals and alloys, slags and fluxes, blast and gases, smoke and fume. Prerequisites: Chem. 1 or 3, Phys. 1. First semester (2).

Met. 2. METALLURGY OF IRON AND STEEL. Chemical and physical properties of iron. Iron ores, preparation of ores, the blast furnace, the mixer, remelting, refining, puddling, the Bessemer process, the open-hearth process, duplex process, cementation, manufacture of crucible steel, electric steel, alloy steels, castings, forgings, and heat treatment. Prerequisite: Met. 1. Second semester (2).

Met. 3. METALLURGY OF COPPER, LEAD; AND ASSOCIATED METALS. COPPER: chemical and physical properties, ores, smelting, sulphide ores, converting, treatment of oxide ores, wet process, electrolytic processes, brass and bronze. LEAD: chemical and physical properties, ores, smelting processes, condensation of lead fume, refining and desilverization of base bullion. ASSOCIATED METALS: gold, silver, platinum, selenium and tellurium, bismuth. A two-day inspection trip (expense about \$10.00) is required. Prerequisite: Met. 1. First semester (2).

Met. 4. METALLURGY OF ZINC, ALUMINUM, AND THE MINOR METALS. ZINC: chemical and physical properties, ores, reduction by furnace and electrolytic processes, electrothermic processes, manufacture of zinc oxide. MERCURY: chemical and physical properties, ores, processes of extraction. GOLD AND SILVER: amalgamation, cyaniding, refining, properties, alloys. ALUMINUM: chemical and physical properties, ores, extraction by electrolysis, light alloys. TIN, NICKEL, ANTIMONY, etc.: chemical and physical properties, ores, processes of extraction, alloys. A one-day inspection trip (expense about \$3.00) is required. Prerequisite: Met. 1. Second semester (2).

Met. 5. ELECTROCHEMISTRY. Lectures and recitations concerning the phenomena of electrolysis and electrolytic conduction; current phenomena; voltage phenomena; energy relations; electrode reactions; the electrolytic cell; primary cells and storage batteries; electric arcs and discharges through gases. Prerequisites: Chem. 20, Phys. 6. First semester (1).

Met. 21. ENGINEERING METALLURGY. An abridgment of Met. 1, 2, 3, and 4, especially adapted to the viewpoint of users of metals. Prerequisite: Chem. 1 or 3. First and second semesters (2).

Met. 23. FERROUS METALLURGY. Especially adapted from Met. 21 for students taking the curricula in Chemistry and Chemi-

cal Engineering. Prerequisite: Chem. 1 or 3. First semester (2).

Met. 24. SHORT COURSE IN NON-FERROUS METALLURGY. Continuation of Met. 23. Prerequisites: Phys. 4 and 6. Second semester (2).

Met. 25. ELECTROCHEMISTRY AND ELECTROMETALLURGY. Lectures and recitations concerning the phenomena of electrolysis and electrolytic conduction; current phenomena; voltage phenomena; energy relations; electrode reactions; the electrolytic cell; primary cells and storage batteries; electric arcs and discharges through gases; electrothermics; practical applications of electricity to metallurgical processes. Prerequisites: Chem. 20, Met. 1 or 21, Phys. 6. First semester (2).

Met. 33. METALLURGICAL LABORATORY. The internal structure of metals and industrial alloys; effect of cold rolling and annealing. Heat treatment of alloys including case-hardening of steels; foundry experiments; fatigue and corrosion testing of metals; duralumin; electric arc welding. Use of instruments and apparatus employed in metallurgical work, such as pyrometers, hardness testing machines, microscopes, gas and electric furnaces, etc. Prerequisites: Phys. 4 and 6 (Phys. 4 may be taken concurrently). Fee, \$5.00. First and second semesters (1).

Met. 34. METALLURGICAL LABORATORY. Continuation of Met. 33. Fee, \$5.00. Second semester (1).

Met. 35. ELECTROCHEMICAL LABORATORY. Quantitative relations in the deposition of metals by electrolysis. Experimental study of the conditions controlling the nature of electrolytic deposits, electrolysis of fused salts, cathodic and anodic reactions. Must accompany Met. 25. Fee, \$5.00. First semester (1).

Met. 44. METALLURGICAL PLANT VISITS. Visits of inspection and study to plants extracting, refining, working, fabricating, treating, or otherwise producing or utilizing metallic bodies in a metallurgical sense. Written reports of visits are required and occasional quizzes on observations made. Second semester (1).

Met. 46. METALLURGICAL PLANT VISITS. Continuation of Met. 44. Second semester (1).

Met. 48. SUMMER WORK. At the end of the sophomore year, eight weeks practical experience in industrial plants is required of students who do not take Chem. 39 or M.S.T. 9 or 19.

Met. 49. SUMMER WORK. At the end of the junior year students in the curriculum in Metallurgical Engineering are required to secure in industrial plants at least eight weeks' practical experience.

Met. 61. PROBLEMS IN GENERAL METALLURGY. A course of problems embodying the use of physical, chemical, and mechanical principles as the basis of practical metallurgy. Data are taken, as far as possible, from actual practice, so that the results have an important bearing in the understanding of metallurgical processes. Prerequisites: Chem. 1 or 3, and 8, Phys. 1. Second semester (1).

Met. 62. PROBLEMS IN IRON AND STEEL METALLURGY. A course of problems involving the fundamental principles of the various processes in the metallurgy of iron and steel, to give the student an understanding of the quantitative relationships in the processes. Prerequisites: Met. 1 and 61. Must accompany Met. 2. Second semester (1).

Met. 81. SHORT COURSE IN METALLURGICAL ENGINEERING PROBLEMS. An abridgment of Met. 61 and 62. Prerequisites: Chem. 1 or 3, and 8, Phys. 1. Must accompany Met. 21. First and second semesters (1).

Met. 83. SHORT COURSE IN METALLURGICAL ENGINEERING PROBLEMS. Same as Met. 81, but adapted for students taking the curriculum in Chemical Engineering. Prerequisites: Chem. 1 or 3, and 8, Phys. 1. Must accompany Met. 23. First semester (1).

Met. 84. SHORT COURSE IN NON-FERROUS METALLURGICAL PROBLEMS. An abridgment of Met. 163 and 164. Must accompany Met. 24. Prerequisites: Met. 61, 81 or 83. Second semester (1).

Met. 90. THESIS IN METALLURGY. Candidates for the degree of B.S. in Metallurgical Engineering may, with the approval of the head of the department, undertake a thesis as a portion of the work during the senior year. First and second semesters (3).

For Advanced Undergraduates and Graduates

Met. 106. ELECTROMETALLURGY. Lectures discussing the practical application of electricity to metallurgical processes. Electrolytic and electric furnace plants and practice. Prerequisites: Met. 1 and 5. Second semester (1). Associate Professor Butts.

Met. 130. PHYSICAL METALLURGY. The states of matter; physical structure and constitution of metals; X-rays and crystal structure; effect thereon of mechanical working, heat treatment, composition, etc.; including polishing and examination of microsections and an introduction to metallography; casting, shaping, welding, and testing metal objects. Lectures and laboratory work. Prerequisites: Met. 1 or 21 or 23. Fee, \$5.00. Second semester (3). Associate Professor Doan, Assistant Professor Harvey.

Met. 131. METALLOGRAPHY. Internal structures of alloys as revealed by the constitutional diagram. The X-ray and microscopic methods of studying metal structures. The close relation between structure and properties in industrial alloys such as steel, brass, duralumin, cast iron, stainless steel, etc. Lectures, problems, and laboratory experiments. Prerequisites: Met. 1 and 2 or Met. 130. Fee, \$5.00. First semester (3). Associate Professor Doan.

Met. 132. METALLURGICAL LABORATORY. Principles of process metallurgy, such as alloying, galvanizing, measurement of air volume and moisture content, desilverization of lead, cementation of steel, electrolysis, hydrometallurgy, heat transfer, heat conduction, and radiation. Principles of physical metallurgy, such as the effect of mechanical work and heat treatment, influence of impurities, etc. Calibration and use of instruments employed in metallurgical investigations, pyrometers, calorimeters, etc. Determination of efficiencies of furnaces. Experiments with electrochemical processes, electric furnaces, etc. Prerequisites: Met. 3, 25, and 130 or 131. Fee, \$10.00. Second semester (2). Associate Professor Butts, Associate Professor Doan, Assistant Professor Harvey.

Met. 139. SEMINAR. Conference hours of the staff of the department with students, to discuss current metallurgical literature, processes, and problems; involving reading of current

English and foreign literature and verbal presentation by the students. Training in the preparation and presentation, both oral and written, of engineering reports. First semester (2). Associate Professor Doan.

Met. 140. SEMINAR. Continuation of Met. 139. Second semester (1). Associate Professor Doan.

Met. 152. ADVANCED METALLURGY OF IRON AND STEEL. Continuation of Met. 2 for seniors and graduate students. Prerequisite: Met. 2. Second semester (2). Professor Stoughton.

Met. 153. ADVANCED METALLURGY OF IRON AND STEEL. Prerequisite: Met. 2 and the approval of the department head. First and second semesters (1). Professor Stoughton.

Met. 154. ADVANCED METALLURGY OF IRON AND STEEL. Prerequisite: Met. 153 and the approval of the department head. First or second semester (1). Professor Stoughton.

Met. 163. PROBLEMS IN THE METALLURGY OF COPPER, LEAD, GOLD, AND SILVER. A course of problems concerned with the principles utilized in the metallurgy of copper, lead, silver, and gold. Prerequisite: Met. 61. Must accompany Met. 3. First semester (1). Associate Professor Butts.

Met. 164. PROBLEMS IN THE METALLURGY OF ZINC, ALUMINUM, AND THE MINOR METALS. A course of problems concerned with the principles utilized in the metallurgy of zinc, aluminum, etc. Prerequisite: Met. 61. Must accompany Met. 4. Second semester (1). Associate Professor Butts.

Met. 172. ADVANCED PHYSICAL METALLURGY. A selective course including advanced study in the fundamental fields with a review of the current literature as the study in each field is concluded. Prerequisites: Met. 130 and 131. First semester (2). Associate Professor Doan.

Met. 173. ADVANCED PHYSICAL METALLURGY. Continuation of Met. 172. Prerequisite: Met. 2. Second semester (2). Associate Professor Doan.

For Graduates

Met. 201. METALLURGICAL INVESTIGATION AND THESIS. Study of the literature and investigation of some special metallurgical

problems, such as: an improvement or innovation in some metallurgical process; the establishment of an equilibrium diagram of a series of alloys; the effect of heat treatment on a metal or alloy; or some other contribution to metallurgical knowledge, or else confirmation of knowledge not yet fully established. The study and investigation must be embodied in a written report. Prerequisites: Met. 2, 3, or 4. First and second semesters (6). Professor Stoughton, Associate Professor Butts, Associate Professor Doan, Assistant Professor Harvey.

Met. 202. METALLURGICAL INVESTIGATION AND THESIS. Continuation of Met. 201. First and second semesters (3). Professor Stoughton, Associate Professor Butts, Associate Professor Doan, Assistant Professor Harvey.

MILITARY SCIENCE AND TACTICS

**MAJOR GREEN, CAPTAINS SADLER, KECK, RICE, AND TOW,
SERGEANTS MOHRING, GASDA, AND O'BRIEN**

An infantry unit of the Reserve Officers' Training Corps was established at Lehigh University in September, 1919. Conducted on a voluntary basis during the year 1919-1920, the unit had a membership of 313 students. A year later the trustees and faculty of the University made the Basic Course, Military Science and Tactics, a required subject, under the R.O.T.C. regulations, for physically fit freshmen and sophomores.

An ordnance unit was established at this University in September, 1925. For Basic Ordnance students the course is the same as for Basic Infantry. For Advanced Ordnance, students in the College of Engineering are eligible, preference being given to those in Mechanical, Chemical, Metallurgical, and Electrical Engineering.

The military courses included under the War Department regulations consist of two years of basic work and two years of advanced work along specialized lines. Students who complete the four-year course satisfactorily become eligible for commissions as second lieutenants in the Officers' Reserve Corps.

Uniform and equipment are furnished by the Government; each student must provide suitable shoes and belt. Each student to whom government property is issued is required

to make a cash deposit of \$25.00, which is refunded in full upon the return of the property in good condition; this deposit is payable at the time of registration for the first semester. During the advanced course students are paid commutation of subsistence, amounting to approximately \$9.00 a month. The number of students who may take the advanced course is limited by the annual appropriations.

Infantry students make an inspection trip to Gettysburg battle field in the spring of the senior year. Ordnance students make an inspection trip to Picatinny Arsenal in the spring of the junior year and to Frankford Arsenal in the fall of the senior year.

Infantry Unit

Mil. 1. **BASIC COURSE**, First Year. Fundamental military training common to all arms of the service. Theoretical and practical instruction in marksmanship, military courtesy, military hygiene and first-aid, physical drill, and command and leadership. Three hours a week. First semester (2).

Mil. 2. **BASIC COURSE**, First Year. Continuation of Mil. 1. Second semester (2).

Mil. 3. **BASIC COURSE**, Second Year. Fundamental military training common to all arms of the service. Theoretical and practical instruction in drill and command, musketry, automatic rifle, scouting and patrolling, and combat principles of rifle squad. Students who indicate suitable proficiency in this course are appointed corporals in the R.O.T.C. unit. Three hours a week. First semester (2).

Mil. 4. **BASIC COURSE**, Second Year. Continuation of Mil. 3. Second semester (2).

Mil. 5. **ADVANCED COURSE, INFANTRY**, First Year. Theoretical and practical instruction in drill and command, military sketching, map reading, infantry weapons (machine gun, 37 mm. and 3 in. trench mortor), combat principles, rifle and machine gun section and platoon. Students who indicate suitable proficiency in this course are appointed sergeants in the R.O.T.C. unit. Five hours a week. First semester (3).

Mil. 6. **ADVANCED COURSE, INFANTRY**, First Year. Continuation of Mil. 5. Second semester (3).

Mil. 7. ADVANCED COURSE, INFANTRY, Second Year. Theoretical and practical instruction in field engineering, principles of camouflage, organized Reserve Corps regulations, administration, military history and national defense act, combat principles, tactical exercises, map problems, command and leadership, and military law. Students who indicate suitable proficiency in this course are appointed commissioned officers in the R.O.T.C. unit and upon graduation are appointed second lieutenants in the Infantry Officers' Reserve Corps. Five hours a week. First semester (3).

Mil. 8. ADVANCED COURSE, INFANTRY, Second Year. Continuation of Mil. 7. Second semester (3).

Mil. 9. ADVANCED CAMP, INFANTRY. Compulsory for students who elect the advanced course. Generally held in summer between junior and senior years. (3).

Ordnance Unit

Mil. 11. BASIC COURSE, First Year. Same as Mil. 1. First semester (2).

Mil. 12. BASIC COURSE, First Year. Continuation of Mil. 11. Same as Mil. 2. Second semester (2).

Mil. 13. BASIC COURSE, Second Year. Same as Mil. 3. First semester (2).

Mil. 14. BASIC COURSE, Second Year. Continuation of Mil. 13. Same as Mil. 4. Second semester (2).

Mil. 15. ADVANCED COURSE, ORDNANCE. First Year. Five hours a week, three hours of which are credited to technical courses in the regular engineering curricula. Two hours' instruction weekly is given in the following military subjects: matériel, ammunition and explosives, current ordnance problems. Students who indicate suitable proficiency in this course are appointed sergeants in the R.O.T.C. unit. First semester (1½).

Mil. 16. ADVANCED COURSE, ORDNANCE, First Year. Continuation of Mil. 15. Second semester (1½).

Mil. 17. ADVANCED COURSE, ORDNANCE, Second Year. Five hours a week, three hours of which are credited to technical

courses in the regular engineering curricula. Two hours' instruction weekly is given in the following military subjects: property accounting and ordnance financial procedure, military law, administration and supply, organization of the Ordnance Department, industrial mobilization, current ordnance problems, elementary ordnance engineering. Students who indicate suitable proficiency in this course are appointed officers in the R.O.T.C. unit and upon graduation are appointed second lieutenants in the Ordnance Officers' Reserve Corps. First semester (1½).

Mil. 18. ADVANCED COURSE, ORDNANCE, Second Year. Continuation of Mil. 17. Second semester (1½).

Mil. 19. ADVANCED CAMP, ORDNANCE. Compulsory for students who elect the advanced course. Generally held in summer between junior and senior years. (3).

Mil. 20. ADVANCED ORDNANCE. Drill and command. Elective for students taking Mil. 15. First semester (½).

Mil. 21. ADVANCED ORDNANCE. Continuation of Mil. 20. Second semester (½).

Mil. 22. ADVANCED ORDNANCE. Continuation of Mil. 21. First semester (½).

Mil. 23. ADVANCED ORDNANCE. Continuation of Mil. 22. Second semester (½).

MINING ENGINEERING

PROFESSOR ECKFELDT, ASSOCIATE PROFESSOR SINKINSON

Mine. 1. MINING ENGINEERING. Prospecting: modes of occurrence of minerals; uses of geology; prospecting for placers, veins, and beds; magnetic prospecting; drilling; sampling; valuation of property; location of claims; patenting mining ground. Boring: uses of bore-holes; methods—percussion and rotation; survey of bore-holes. Transportation: haulage; surface and underground methods; ropes, motors, and cars; aerial tramways; loading and unloading; storage of mineral; transportation of workmen; mine tracks; signaling; hoisting; motors, ropes, receptacles; safety appliances; systems of hoisting. First semester (3).

Mine. 2. MINING METHODS. Exploitation: methods of working deposits; location of surface plant; rock-drilling, tools and machines; air compressors; use of explosives and blasting; safety regulations; quarrying; tunneling, slope and shaft sinking; timbering; support of excavations by wood, steel, and concrete; methods of mining; stripping; hydraulicing; dredging; room and pillar; longwall; stoping; filling; caving; topslicing; robbing; coal cutting machinery; conveyors; mechanical loaders. First semester (3).

Mine. 3. ORE DRESSING; COAL PREPARATION; LABORATORY. General principles and physical properties upon which the recovery of minerals from ores is based, followed by detailed study of machines and apparatus used for coarse and fine crushing; classifying and preparation for concentration; various methods of concentration, including gravity and magnetic methods, oil flotation, etc. Study of procedure followed for treatment of ores in typical concentrating plants; visits to mills; experimental work in ores, giving practical application of principles and processes covered. General principles of concentration applied to the preparation of coal. Visits to breakers and coal washers. A well-equipped laboratory affords opportunity for individual as well as class operation of machines and apparatus. Fee, \$5.00. First semester (3).

Mine. 5. MINING ENGINEERING. Drainage: surface water, prevention of access; mine dams; tunnel drainage; mechanical drainage, water-hoisting, pumping, classes of pumps. Ventilation: mine air; ventilation of air; natural and mechanical methods of ventilation; systems, multiple entry, splitting; ventilating machines, fans and blowers; testing air; ventilation laws. Lighting: methods in use, safety lamps, electric lighting; safety regulations. First aid: causes of accidents, means of prevention, rescue work; first aid to injured; hygiene of mines. Railroad construction: earthwork, culverts, retaining walls, piling, tunnels, trestles, bridges, track-work; railroad structures. Second semester (3).

Mine. 6. MINE SURVEYING. Forms for keeping notes; surface surveys; determination of true meridian, latitude, and time from observations on Polaris and sun; connecting surface surveys with mine surveys through tunnels, slopes, and shafts;

calculation of notes; mine mapping; mine problems; practice in mine surveying. Mine railroads: preliminary and location surveys; theory of curves; railroad mapping; calculation of earthwork; curve and compensation problems; practice in railroad surveying. Prerequisite: C.E. 6. Second semester (3).

Mine. 7. CONSTRUCTION. The use of stone, brick, concrete, and wood as structural material for foundations, piling, dams, retaining walls, mine buildings, railroads, trestles, tipplers, ore bins, etc. First semester (2).

Mine. 8. OIL FIELD PRACTICE. Distribution of petroleum and natural gas; valuation of oil lands. Location of wells; development-drilling and production methods. Transportation; storage; fires; avoidable waste and conservation of oil and gas resources. Refining methods; casing-head gasoline. Second semester (2).

Mine. 9. MINE ADMINISTRATION AND LAW. Organization, management; principles of mining. Property in mines and minerals; mining leases; rights and liabilities of mine operators; surface and lateral support; disposal of mine refuse and water. Locating and patenting mining ground. Mining law of the United States and foreign countries. Second semester (1).

Mine. 10. FUEL TECHNOLOGY. Economic, statistical, scientific aspects. Fuel resources. Analysis of fuels, including gas analysis. Calorimetry; pyrometry; radiometry. Classification of fuels. Colloidal fuels. M.E. students take certain parts of this course. First semester (2).

Mine. 11. FUEL TECHNOLOGY. Theoretical aspects and practice in the utilization of fuels, with the incidental methods of laboratory investigation. Chemical composition of fuels; carbonization at low and high temperatures; complete gasification of fuels, with laboratory practice. Second semester (2).

Mine. 12. FUEL TECHNOLOGY LABORATORY. Fuel analysis, calorimetry, technical pyrometry, gas analysis, testing the properties of coals and yield of various distillation products at low and high temperatures, extraction of coal by solvents. Prerequisites: Chem. 1 or 3 and 11, 12, or 13. Deposit, \$10.00. First semester (1).

Mine. 13. FUEL TECHNOLOGY LABORATORY. The chemical and physical examination of liquid fuels, calorimetry, vapor pressure tests of gasoline, viscosity of lubricants by standard methods. Prerequisite: Chem. 1 or 3 and 11, 12, or 13. Deposit, \$10.00. Second semester (1).

Mine. 15. MINING ENGINEERING. A general survey of the elements of mining engineering adapted to the needs of students in the curriculum in Industrial Engineering. Prospecting, boring, excavation and support, exploitation, transportation, drainage, ventilation, lighting, mineral preparation. Prerequisite: junior standing. Second semester (3).

Mine. 20. SUMMER WORK. Industrial employment for eight weeks, following the junior year, with report.

For Graduates

Students desiring to do graduate work in mining engineering should consult with the professor of Mining Engineering with regard to their qualifications.

Mine. 201. METHODS OF MINING. The study of methods used in a given mining region, or in the production of a given class of materials, with respect to conditions influencing choice of method and cost. First semester (5). Professor Eckfeldt.

Mine. 202. METHODS OF MINING. Continuation of Mine. 201. Second semester (5). Professor Eckfeldt.

Mine. 203. MINING PLANT. The determination of the efficiency of mining machinery of given types under varying conditions. First semester (5). Professor Eckfeldt.

Mine. 204. MINING PLANT. Continuation of Mine. 203. Second semester (5). Professor Eckfeldt.

Mine. 205. ORE-DRESSING AND COAL WASHING PLANT. The study of certain operations incident to the dressing of ores or the preparation of coal. Determination of efficiency of machines and processes. Losses in dressing. First semester (5). Associate Professor Sinkinson.

Mine. 206. ORE-DRESSING AND COAL WASHING PLANT. Continuation of Mine. 205. Second semester (5). Associate Professor Sinkinson.

Mine. 207. FUEL TECHNOLOGY RESEARCH. Physical and chemical investigations of coals and fuel oils; gas analysis; ignition phenomena; mechanism of combustion; surface combustion; heat recuperation. General study of methods employed in carbonizing coal between 500° and 1200° C., including recovery of by-products; coal-gas and coking industries. First semester (4). Associate Professor Sinkinson.

Mine. 208. FUEL TECHNOLOGY RESEARCH. Continuation of Mine. 207. Second semester (4). Associate Professor Sinkinson.

MORAL AND RELIGIOUS PHILOSOPHY

PROFESSOR BEARDSLEE

As a prerequisite to graduation the University requires all of its students to take instruction in the philosophy of conduct and religion in order that they may acquire some familiarity with the best thought concerning the spiritual and moral problems of men. The emphasis is continually upon the certainties of knowledge and faith by which men live. The purpose is constructively to help the student to clarify and enrich his own living philosophy of life. This requirement may be satisfied by (a) attendance at chapel on an average of at least three times a week for two years, or (b) satisfactory completion of two courses in this department.

M.R.Phil. 11. INTRODUCTION TO MORAL AND RELIGIOUS PHILOSOPHY. Statement and analysis of problems and theories common to philosophy of conduct and philosophy of religion. First and second semesters (1).

M.R.Phil. 12. PHILOSOPHY OF CONDUCT. Analysis of such problems as: the terms good and bad, right and wrong; the sources of moral distinctions; responsibility and freedom; progress; happiness. Prerequisite: M.R.Phil. 11. First and second semesters (1).

M.R.Phil. 13. PHILOSOPHY OF CONDUCT. Historical and case study of systems of ethics. First semester (1).

M.R.Phil. 14. PHILOSOPHY OF CONDUCT. Continuation of M.R.Phil. 13. Prerequisite: M.R.Phil. 13. Second semester (1).

M.R.Phil. 16. PHILOSOPHY OF RELIGION. A study of the origin, nature, and validity of religious experience. Prerequisite: M.R.Phil. 11. Second semester (1).

M.R.Phil. 17. COMPARATIVE RELIGION. Philosophical study of the source materials and authoritative expositions of living religions in order to orient the students' own convictions in the varieties of effective faith. Prerequisite: M.R.Phil. 11 or junior standing. First and second semesters (1).

M.R.Phil. 18. COMPARATIVE RELIGION. Continuation of M.R. Phil. 17. Prerequisite: M.R.Phil. 17. Second semester (1).

CHAPEL

Chapel is not a course or a class but it is regarded by the University as an instructional exercise. It is the intention of the University that students who elect chapel may receive from the chapel readings and addresses the same kind of instruction as is given to those who elect courses in philosophy of conduct and the philosophy of religion, but chapel instruction is given in such a place and in such a way as to encourage worship at the will of the individual student.

Chapel exercises ordinarily consist of readings from the literature of ethics and religion, prayers from the literature of various religions, and organ selections from classical music. These exercises are held daily from Monday to Friday, inclusive, from 7:45 to 8:00 a.m. The four possible semester-numbers of chapel are recorded as M.R.Phil.-Chapel 1, 2, 3, 4. All students are invited to attend chapel exercises.

MUSIC

MR. SHIELDS

Mus. 3. HISTORY AND APPRECIATION OF MUSIC. A study of the development of music from early civilizations to the end of the polyphonic period. Illustrated. First semester (3).

Mus. 4. HISTORY AND APPRECIATION OF MUSIC. A study of the music of the formal period and the romantic period; nationalism and modern tendencies in music. Illustrated. Second semester (3).

Mus. 5. HARMONY. A study of the selection and progression of chords. Prerequisite: some knowledge of music. Students

should consult the instructor before registering for the course. First semester (3).

Mus. 6. HARMONY. Continuation of Mus. 5 and the study of modulation. Second semester (3).

PHILOSOPHY

PROFESSOR HUGHES, ASSISTANT PROFESSOR F. C. BECKER

Phil. 3. INTRODUCTION TO PHILOSOPHY. A systematic approach to the several types of problem which philosophic inquiry brings to the fore. Textbook and collateral readings; discussions. First and second semesters (3).

Phil. 14. LOGIC AND SCIENTIFIC METHOD. Introduction to traditional and symbolic logic and to the history of scientific method. Textbook and collateral readings; discussions. Second semester (3).

Phil. 15. ETHICS: THE THEORY OF CONDUCT. A study of universal principles advanced for the guidance of conduct. Lectures and discussions. Prerequisite: 3 hours in philosophy. Second semester (3).

Phil. 16. THE THEORY OF NATURE. It is clear that current conceptions of nature need thoroughgoing examination if modern thought is to deal intelligently with the problems it faces. The views of Whitehead, Bergson, and Dewey are studied and contrasted in detail. Reports and discussions. Prerequisite: three hours in philosophy. Second semester (3).

Phil. 17. CURRENT PHILOSOPHICAL PROBLEMS. An introductory course which surveys the problems now discussed in philosophical works of general and even popular interest, including certain works of Russell, Dewey, Bergson, Croce, Lippman, and others. Reports and discussions. Prerequisite: junior standing or consent of the head of the department. First semester (3).

For Advanced Undergraduates and Graduates

Phil. 101. HISTORY OF PHILOSOPHY: ANCIENT. From the beginnings of scientific and philosophical reflection in Ionia to the breakdown of the ancient world. A textbook is employed to systematize and give continuity to the subject matter, but

several of the more important dialogues of Plato are studied in detail, together with selections from Aristotle, and collateral readings in translations from other ancient philosophers. Lectures, class discussions, and recitations. Prerequisite: junior standing or the consent of the head of the department. First semester (3). Assistant Professor Becker.

Phil. 102. HISTORY OF PHILOSOPHY: MEDIEVAL AND MODERN. Mediæval philosophy is treated by textbook and by lectures, while attention is given chiefly to the development of modern thought in the seventeenth, eighteenth, and nineteenth centuries with detailed study of some representative works in this period and collateral readings of others. Lectures, class discussions, and recitations. Prerequisite: junior standing or the consent of the head of the department. Second semester (3). Assistant Professor Becker.

Phil. 107. SEMINAR IN CONTEMPORARY PHILOSOPHY. Devoted chiefly to philosophy since 1900 in the English speaking countries, with some attention to the related movements in France, Germany, and Italy. Each student prepares during the year a paper on each of three contemporary philosophers representing diverse tendencies. Prerequisite: six hours in philosophy. First semester (3). Assistant Professor Becker.

Phil. 108. SEMINAR IN CONTEMPORARY PHILOSOPHY. Continuation of Phil. 107. Second semester (3). Assistant Professor Becker.

Phil. 109. THE THEORY OF ART AND OF BEAUTY. An attempt to reach a consistent, inclusive account of the place of the esthetic in the life of man and in social organization and history. Lectures, reports, and discussions. Prerequisite: junior standing or consent of the head of the department. First semester (3). Professor Hughes.

Phil. 110. THE THEORY OF KNOWLEDGE. An attempt to trace certain problems of modern thought and science to their source in the "metaphysical heart" of experience. Reports and discussions. As a preliminary study Phil. 14 is desirable but not essential. Prerequisite: junior standing or consent of the head of the department. Not given in 1932-1933. First semester (3). Professor Hughes.

Phil. 111. THE THEORY OF EDUCATION. A critical examination of the ideas and ideals involved in the enterprise of education: their validity, and their bearing on the facts and theories of individuality, society, progress, and democracy. Educational subject matter and techniques are examined from the point of view of the principles involved. Chiefly readings and class discussions. Prerequisite: junior standing or consent of the head of the department. Not given in 1933-1934. First semester (3). Professor Hughes.

Phil. 112. THE THEORY OF HUMAN RELATIONS. Social and political philosophy: a critical examination of the classical theories in this field, and their assumptions with regard to human nature, justice, and liberty. Historical and constructive. Readings, class discussions, papers. Prerequisite: junior standing or consent of the head of the department. Not given in 1932-1933. Second semester (3). Assistant Professor Becker.

For Graduates

Prerequisite to major graduate work in philosophy: four undergraduate courses in philosophy or equivalent preparation.

Phil. 201. HISTORY OF PHILOSOPHY. ADVANCED: ANCIENT AND MEDIEVAL. Considerable attention is paid to the effect of Greek philosophy upon Christian doctrine. Alternating with Phil. 205. First semester (3). Assistant Professor Becker.

Phil. 202. HISTORY OF PHILOSOPHY. ADVANCED: MODERN. The emphasis is placed upon Hobbes, Spinoza, Leibnitz, and Locke; upon Kant and Hegel; and upon Bergson and James. Alternating with Phil. 206. Second semester (3). Assistant Professor Becker.

Phil. 205. PLATO. Discussion deals chiefly with contrast between the dialectic and the poetic phases of Plato's thought. Prerequisites: Phil. 1, and 2, 3, or 14. Alternating with Phil. 201. First semester (3). Assistant Professor Becker.

Phil. 206. SPINOZA. The *Emendation* and the *Ethics*. Discussion largely relates to current "philosophies of science." Prerequisites: Phil. 101, and 3, 14, or 102. Alternating with Phil. 202. Second semester (3). Assistant Professor Becker.

Phil. 208. THESIS IN PHILOSOPHY. First semester (2) or (3). Professor Hughes, Assistant Professor Becker.

Phil. 209. THESIS IN PHILOSOPHY. Second semester (2) or (3). Professor Hughes, Assistant Professor Becker.

PHYSICAL EDUCATION

PROFESSOR REITER, ASSISTANT PROFESSOR BARTLETT,
MESSRS. KANALY AND MAHONEY

The aim of the department of Physical Education is to insure the health and physical development of every student of the University. Facilities for accomplishing this aim are afforded in Taylor Gymnasium, the field house, the two playing levels of Taylor Field, and Lehigh Field.

Each student, upon entering the University, is given a physical examination by the director of the Students' Health Service, assisted by the department of Physical Education. He is advised as to postural and physical defects.

All students are required to take regular exercise under departmental supervision. This requirement calls for two hours a week in the gymnasium, or participation, under the oversight of the director, in one of the following organized sports: football, cross-country running, basketball, wrestling, swimming, soccer, track, lacrosse, tennis, and baseball. All students are urged and encouraged to participate in these activities. Members of the R.O.T.C. unit substitute one hour of military drill for one of the two hours of required physical education.

Individual exercise is held for the correction of physical and functional defects. This group of students is carefully examined preliminary to taking up the work and individually guided during each period.

A large number of activities are offered to the student to choose from, keeping in mind that the well-trained man is one who has skill, strength, and speed. A student is encouraged to change his activity whenever it is thought best for the all-round development of his personality. Opportunity is offered in the following activities: mass exercises, mass swimming,

beginners' swimming, boxing, fencing, apparatus stunts, handball, life-saving, athletic dancing, wrestling, and track. All undergraduate students must swim seventy-five feet before graduation.

In recent years there has been an evergrowing demand that the general student body shall reap the benefits of organized sports. This demand is constantly being met by the department in the form of organized activities in all branches. These interests have extended to dormitory, fraternity, interclass, and independent groups. One of the objectives of the department is to interest the student in that form of activity which will provide him with an interest throughout his after life.

The coaches cooperate with the department in the supervision of various intercollegiate freshman and varsity sports. All records of attendance are kept by the department of Physical Education.

The University maintains a well-equipped dispensary where medical treatment may be secured. Any student who receives a personal injury while engaged in any sport must report the injury as soon as possible to the director of the Students' Health Service.

P.E. 1. PHYSICAL EDUCATION. Freshman first semester.

P.E. 2. PHYSICAL EDUCATION. Freshman second semester.

P.E. 3. PHYSICAL EDUCATION. Sophomore first semester.

P.E. 4. PHYSICAL EDUCATION. Sophomore second semester.

P.E. 5. PHYSICAL EDUCATION. Junior first semester.

P.E. 6. PHYSICAL EDUCATION. Junior second semester.

P.E. 7. PHYSICAL EDUCATION. Senior first semester.

P.E. 8. PHYSICAL EDUCATION. Senior second semester.

For Juniors and Seniors

The following courses are open only to juniors and seniors preparing themselves for professional careers in teaching and athletic coaching.

P.E. 22. THEORY AND PRACTICE OF FOOTBALL. (1) Preliminaries: equipment, conditioning, passing in its various forms, blocking, tackling, following and falling on the ball, punting,

drop-kicking, place and goal kicking, methods of warding off and eluding the tacklers. (2) Offense: the advantages and disadvantages of the "huddle system" vs. the old system of signals. The various systems of plays among the colleges. (3) Defense: the various systems in use and their application in the different zones of the field. The strategy of meeting open, closed, and kick formations. Defense against forward passes, kicks, etc. Team play, field tactics, coaching systems, individual positions, the coach and his personality, and the development of personality in players. The place of scouting, planning the practice periods, play, work, and fatigue. Special stress upon sportsmanship, ethical and educational factors relating to the game; considerable time spent on first aid and treatment of injuries, training, and personal hygiene. Throughout the course discussions and interpretations of the rules are held. Textbooks and discussion. Three exercises in class room, one hour practical demonstration. Second semester (3).

P.E. 23. THE ORGANIZATION AND ADMINISTRATION OF PHYSICAL EDUCATION: THEORY. A course dealing with the problems of the organization and supervision of physical education programs. This course includes the history of physical education systems, the administration of intramural activities, the qualifications of physical educators, the methods of teaching, and the planning of programs. Textbook is Williams' *Principles of Physical Education*. Outside readings, reports, and surveys required. Second semester (2).

P.E. 24. THE ORGANIZATION AND ADMINISTRATION OF PHYSICAL EDUCATION: PRACTICE. The practice of teaching mass physical activities, including athletics, combative events, gymnastic games, apparatus stunts, and efficiency tests. Programs of corrective exercise for postural defects are considered. The student is given an opportunity to do creative work in the field of physical education. Three hours practice a week. Second semester (1).

PHYSICS

PROFESSOR BIDWELL, ASSOCIATE PROFESSORS BAYLEY, PETERSEN,
AND CARWILE, ASSISTANT PROFESSORS BERGER, FREY, AND
C. R. LARKIN, MESSRS. F. A. SCOTT, M. EWING,
SNAVELY, CRARY, AND KELLY

Phys. 1. ELEMENTARY PHYSICS. Lecture demonstrations and conferences. First and second semesters (4).

Phys. 4. MECHANICS, LIGHT, AND SOUND. Recitations. Prerequisites: Phys. 1, Math. 4. (Math. 4 may be taken concurrently.) First and second semesters (3).

Phys. 5. PHYSICS LABORATORY. Mechanics, light, and sound. Prerequisites: Phys. 1, Math. 4. (Phys. 5 should be taken concurrently with Phys. 4.) Fee, \$6.00. First and second semesters (1).

Phys. 6. ELECTRICITY, MAGNETISM, AND HEAT. Recitations. Prerequisites: Phys. 1, Math. 4. (Math. 4 may be taken concurrently with Phys. 6.) First and second semesters (3).

Phys. 7. PHYSICS LABORATORY. Electricity, magnetism, and heat. Prerequisites: Phys. 1, Math. 4. (Phys. 7 should be taken concurrently with Phys. 6.) Fee, \$6.00. First and second semesters (1).

Phys. 12. INTRODUCTION TO PHYSICS. A survey course for students in the Colleges of Arts and Science and of Business Administration. A brief introduction to the principal fields of physics. Lecture demonstrations, recitations, and laboratory. Fee, \$6.00. First semester (3).

Phys. 13. GENERAL PHYSICS. Continuation of Phys. 12. Lecture demonstrations, recitations, and laboratory. Prerequisite: Phys. 12. Fee, \$6.00. Second semester (3).

Phys. 14. GENERAL PHYSICS. Continuation of Phys. 13, with more emphasis on recent developments. Lecture demonstrations, recitations, and laboratory. Prerequisite: Phys. 13. Fee, \$6.00. First semester (3).

Phys. 15. MODERN PHYSICS. A non-mathematical introduction to contemporary phenomena and theories. Lectures and recitations. Prerequisite: Phys. 14. Second semester (3).

Phys. 50. INDUSTRIAL EMPLOYMENT. Eight weeks industrial employment during the summer following the junior year with submission of a written report.

For Advanced Undergraduates and Graduates

Phys. 110. ELECTRICAL LABORATORY. Precise measurements. Prerequisites: Phys. 1, 6, and 7. Fee, \$6.00. First semester (1). Assistant Professor Larkin.

Phys. 111. ELECTRICAL LABORATORY. Precise measurements. Continuation of Phys. 110. Prerequisite: Phys. 110. Fee, \$6.00. Second semester (1). Assistant Professor Larkin.

Phys. 120. ELECTRIC OSCILLATIONS AND ELECTRIC WAVES. A course dealing with electric oscillations and waves and high frequency phenomena. Prerequisites: Math. 4, Phys. 6 or 14. One laboratory and two class periods a week. Fee, \$6.00. Second semester (3). Assistant Professor Frey, Mr. Snavely.

Phys. 122. PHYSICAL OPTICS AND SPECTROSCOPY. A course dealing with the wave theory of light, interference, diffraction, polarization, etc.; exposition of some phases of spectroscopic phenomena. Prerequisites: Math. 4, Phys. 4 and 6, or 14. One laboratory and two class periods a week. Fee, \$6.00. First semester (3). Assistant Professor Berger.

Phys. 124. ELECTRICAL DISCHARGE THROUGH GASES. A course covering properties of gaseous ions, the experimental data leading to the electron theory, including a study of vacuum tube phenomena, ionization and resonance potential, photo-electricity, etc. Prerequisites: Math. 4, Phys. 6 or 14. One laboratory and two class periods a week. Fee, \$6.00. First semester (3). Assistant Professor Frey, Mr. Snavely.

Phys. 126. HEAT. A course dealing with thermometry, heat transfer, pyrometry, kinetic theory, and an introduction to thermodynamics. Prerequisites: Math. 4, Phys. 4 and 6, or 14. One laboratory and two class periods a week. Fee, \$6.00. Second semester (3). Assistant Professor Berger.

Phys. 127. INTERMEDIATE LABORATORY. Laboratory work on special topics. Fee, \$6.00. First semester (1). Assistant Professor Berger.

Phys. 128. INTERMEDIATE LABORATORY. Laboratory work on special topics. Fee, \$6.00. Second semester (1). Assistant Professor Berger.

Phys. 160. INTRODUCTION TO MODERN PHYSICAL THEORIES. A course on recent developments, including Maxwell's field equations, photo-electricity, radiation, the quantum theory, and the structure of the atom. Prerequisites: Phys. 6 or 14 or their equivalent, Math. 4. First semester (3). Professor Bidwell.

Phys. 161. INTRODUCTION TO MODERN PHYSICAL THEORIES. Continuation of Phys. 160. Prerequisite: Phys. 160. Second semester (3). Professor Bidwell.

Phys. 162. INTRODUCTORY THEORY OF ELECTRICITY AND MAGNETISM. Magnetic fields and potentials; electrostatic fields, potentials and capacities; the Maxwell-Thomson theory of lines of force; electromagnetic fields; variable and alternating currents. Prerequisites: Phys. 6, Math. 4. First semester (3). Associate Professor Bayley.

Phys. 163. INTRODUCTORY THEORY OF ELECTRICITY AND MAGNETISM. Continuation of Phys. 162. Prerequisite: Phys. 162. Second semester (3). Associate Professor Bayley.

Phys. 164. ADVANCED LABORATORY. Laboratory work of research type. Special problems assigned and the student placed very much on his own initiative. Prerequisite: senior standing. Fee, \$6.00. First semester (1) or (2). Associate Professor Bayley, Dr. Ewing.

Phys. 165. ADVANCED LABORATORY. Continuation of Phys. 164. Prerequisite: senior standing. Fee, \$6.00. Second semester (1) or (2). Associate Professor Bayley, Dr. Ewing.

For Graduates

Math. 219 and 220, Selected Topics in Quantum Mechanics and Relativity, and E.E. 215 and 216, Vacuum Tubes and their Applications, may be included in a graduate major in physics.

Phys. 200. INTRODUCTION TO MATHEMATICAL PHYSICS. The application of mathematical analysis to physics. The subjects

treated include potential theory, hydrodynamics, heat conduction, and wave motion. Prerequisites: Math. 6, Phys. 6, or their equivalent. Not given in 1932-1933. First semester (3). Assistant Professor Larkin.

Phys. 201. KINETIC THEORY. The classical considerations of the kinetic theory of gases substantially as in Jäger with some additional applications to electrical phenomena. Prerequisites: Math. 6, Phys. 126, or their equivalent. Not given in 1933-34. First semester (3). Associate Professor Petersen.

Phys. 202. THERMODYNAMICS. A course devoted principally to classical thermodynamics following Planck. Prerequisites: Math. 6, Phys. 126, or their equivalent. Not given in 1933-34. Second semester (3). Associate Professor Petersen.

Phys. 203. THEORY OF ELECTRICITY. Electrostatics, electrodynamics, and electromagnetic theory treated principally from the classical viewpoint. Prerequisites: Phys. 162, 163, Math. 6, or their equivalent. Not given in 1933-1934. First semester (3). Associate Professor Carwile.

Phys. 204. THEORY OF ELECTRICITY. Continuation of Phys. 203. Prerequisite: Phys. 203. Not given in 1933-1934. Second semester (3). Associate Professor Carwile.

Phys. 205. SPECIAL TOPICS IN CURRENT PHYSICS. Lectures and discussions of current physical problems. The topics treated are determined by the trend of current theoretical and experimental physics and by the specific interests of the students. Prerequisite: permission of the instructor in charge. First semester (1). Assistant Professor Larkin.

Phys. 206. SPECIAL TOPICS IN CURRENT PHYSICS. Continuation of Phys. 205. Prerequisite: same as for Phys. 205. Second semester (1). Assistant Professor Larkin.

Phys. 207. THEORY OF LIGHT. The propagation of light, interference, diffraction; the measurement of wave-length, crystal optics; introduction of quantum theories of the interpretation of spectra. This course follows Shuster and Nicholson's *Theory of Optics*. Prerequisites: Math. 6, Phys. 122, or their

equivalent. Not given in 1932-1933. First semester (3). Associate Professor Petersen.

Phys. 208. THEORY OF LIGHT. Continuation of Phys. 207. Prerequisite: Phys. 207. Not given in 1932-1933. Second semester (3). Associate Professor Petersen.

Phys. 209. ADVANCED DYNAMICS. Principles of statics and dynamics; Lagrange's equations with application to particles and rigid bodies, and the theory of oscillations. Prerequisites: Math. 21, Phys. 4, or their equivalent. Not given in 1932-1933. Second semester (3). Assistant Professor Larkin.

Phys. 211. PHYSICS SEMINAR. Reports on current literature and research in progress. First semester (1). Professor Bidwell.

Phys. 212. PHYSICS SEMINAR. Continuation of Phys. 211. Second semester (1). Professor Bidwell.

PSYCHOLOGY

PROFESSOR FORD, ASSISTANT PROFESSOR GRAHAM, DR. HARRIS,
DRS. HOFFMAN AND KLOPP (LECTURERS)

Psych. 1. ELEMENTARY PSYCHOLOGY. The essentials of the science with brief descriptions of the methods of approach. An orientation course in which the student may evaluate the subject matter in relation to his individual needs. Stress is placed upon a presentation of the facts of the total field rather than any narrowly restricted practical application. Lecture demonstrations, recitations, textbook, and manual of group experiments. First and second semesters (3).

Psych. 4. SOCIAL PSYCHOLOGY. The characteristics of behavior as affected by other people. The effect on personality of one's family, play-life, school, church, social status, occupation, cultural environment. The role of language, of individual differences, of leadership. Group behavior: crowds, fashion, group antagonisms, public opinion, censorship, propaganda. Prerequisite: Psych. 1. First semester (3).

Psych. 6. ABNORMAL PSYCHOLOGY. Mental disorders and mental hygiene. The psychology of emotion and temperament. Tests and methods of classification of cases. Especially advised for senior pre-medical students. Readings, discussions, and a series of clinics at the State Hospital. Prerequisite: Psych. 1. Second semester (3).

Psych. 15. APPLIED PSYCHOLOGY. Tests of vocational aptitude, work and fatigue, motivation, display and persuasion, individual differences, factors that reduce efficiency. Prerequisite: Psych. 1. Second semester (3).

READINGS IN PSYCHOLOGY. Qualified students may pursue a course of readings on some organized topics selected only after consultation with staff members. Professor Ford and Assistant Professor Graham.

For Advanced Undergraduates and Graduates

Psych. 101. PSYCHOLOGY OF INDUSTRIAL PERSONNEL. Psychological techniques in the field of labor management, selection, and employee service. Prerequisite: Psych. 1. Second semester (3). Professor Ford.

Psych. 106. ADVANCED EXPERIMENTAL PSYCHOLOGY. Representative experiments on nerve functions, reflexes, sensation, instinct, emotion, individual differences and their statistical treatment. Prerequisite: Psych. 1. First semester (3). Professor Ford, Assistant Professor Graham.

Psych. 107. ADVANCED EXPERIMENTAL PSYCHOLOGY. Continuation of Psych. 106. Representative experiments in learning, perception, reaction time, attention, and the higher mental processes. Prerequisite: Psych. 1. Second semester (3). Professor Ford, Assistant Professor Graham.

Psych. 111. MINOR RESEARCH. Assigned problems for investigation in either applied or pure science psychology, credit depending on the merit of formal written reports. Prerequisite: Psych. 1. First semester (2) or (3). Professor Ford, Assistant Professor Graham, Dr. Harris.

Psych. 112. MINOR RESEARCH. Either a continuation of Psych. 111, or a different problem for investigation. Pre-

requisite: Psych 1. Second semester (2) or (3). Professor Ford, Assistant Professor Graham, Dr. Harris.

For Graduates

Evidence of the satisfactory completion of at least three undergraduate courses in psychology is demanded of students who wish to do their major graduate work in psychology.

Psych. 202. PSYCHOLOGICAL TESTS AND MEASUREMENTS. Revised to aid an understanding of various types of tests and their uses, including administration, techniques, and necessary statistical computations. Available facts regarding the assumptions, validity, and reliability of specific tests of intelligence, special abilities, accomplishment, personality, interest, and historical charts will be studied with reference to their effective application. Second semester (2) or (3). Assistant Professor Graham.

Psych. 203. SEMINAR AND THESIS IN PSYCHOLOGY. First semester (2) or (3). Professor Ford, Assistant Professor Graham.

Psych. 204. SEMINAR AND THESIS IN PSYCHOLOGY. Second semester (2) or (3). Professor Ford, Assistant Professor Graham.

Psych. 209. SYSTEMATIC PSYCHOLOGY. A historical consideration of the development of psychological systems. The Greek roots of modern psychology, the age of religious influences, the rise of empirical psychology, the creation of the modern laboratory. First semester (3). Professor Ford.

Psych. 210. SYSTEMATIC PSYCHOLOGY. Continuation of Psych. 209. Introspectionistic theories, behaviorism, psychoanalytic theories, associationism versus *Gestalt*, reflexology, and their respective antecedents. Second semester (3). Professor Ford.

Psych. 211. MAJOR RESEARCH. Problems for experimental investigation of graduate level are assigned, credit depending on the merit of formal written reports. First semester (3). Professor Ford, Assistant Professor Graham.

Psych. 212. MAJOR RESEARCH. Either a continuation of Psych. 211, or a different problem. Second semester (3). Professor Ford, Assistant Professor Graham.

ROMANCE LANGUAGES

PROFESSOR FOX, ASSOCIATE PROFESSOR TOOHY,
ASSISTANT PROFESSORS H. C. BROWN AND SOTO,
MESSRS. D. G. SCOTT AND FARNÉ

FRENCH

Fr. 1. ELEMENTARY FRENCH. First semester (3).

Fr. 2. ELEMENTARY FRENCH. Continuation of Fr. 1. Prerequisite: Fr. 1 or the equivalent. Second semester (3).

Fr. 11. INTERMEDIATE FRENCH. Prose and poetry. Balzac, Flaubert, Daudet, Moliere, Corneille, Racine. Society in the seventeenth century. Drill in speaking and writing. Primarily for students in Arts and Science and Business Administration who have had two years of preparatory school French. First semester (3).

Fr. 12. INTERMEDIATE FRENCH. Continuation of Fr. 11. Second semester (3).

Fr. 21. FRENCH CLASSICS. Based on the reading of a number of texts selected mainly from seventeenth and eighteenth centuries. While the main emphasis is placed on correct translation, an accurate knowledge of grammatical construction, idiomatic locutions, and the acquisition of volume in the matter of vocabulary, literary values are also considered and outside reading is assigned on relevant chapters in some history of French literature. Prerequisite Fr. 11. First semester (3).

Fr. 22. FRENCH LITERATURE IN THE SEVENTEENTH AND EIGHTEENTH CENTURIES. Continuation of Fr. 21. Prerequisite: Fr. 11. Second semester (3).

Fr. 31. FRENCH LITERATURE IN THE NINETEENTH CENTURY. Prerequisite: Fr. 21. First semester (3).

Fr. 32. FRENCH LITERATURE IN THE NINETEENTH CENTURY. Prerequisite: Fr. 21. Second semester (3).

Fr. 93. FRENCH ORAL COMPOSITION. TEXTS AND METHODS. A course for students who wish a greater opportunity to practice in the oral and written use of modern French prose. Especially recommended for those who expect to teach French. Pre-

requisite: permission of instructor in charge of the course. First semester (3).

Fr. 94. FRENCH ORAL COMPOSITION. TEXTS AND METHODS. Continuation of Fr. 93. Second semester (3).

For Advanced Undergraduates and Graduates

Fr. 133. CONTEMPORARY FRENCH LITERATURE. Prerequisite: Fr. 21. First semester (3). Professor Fox.

Fr. 134. CONTEMPORARY FRENCH LITERATURE. Continuation of Fr. 133. Prerequisite: Fr. 21. Second semester (3). Professor Fox.

Fr. 141. FRENCH LITERARY HISTORY. General review of French literature. Reading, lectures, and explanation of texts. Prerequisite: Fr. 21. First semester (3). Professor Fox.

Fr. 142. FRENCH LITERARY HISTORY. Continuation of Fr. 141. Prerequisite: Fr. 21. Second semester (3). Professor Fox.

Fr. 145. SEMINAR. A study of the works of some author or group of authors or of a period. Prerequisite: Fr. 21. First semester (3). Associate Professor Toohy.

Fr. 146. SEMINAR. Continuation of Fr. 145. Prerequisite: Fr. 21. Second semester (3). Associate Professor Toohy.

Fr. 151. FRENCH LITERATURE IN THE SIXTEENTH CENTURY AND EARLIER. Prose and poetry. Rabelais, Montaigne, Marot, Villon, Froissart, Commynes. Prerequisite: Fr. 21. Not given in 1933-1934. First semester (3). Professor Fox.

Fr. 152. FRENCH LITERATURE IN THE SIXTEENTH CENTURY AND EARLIER. Continuation of Fr. 151. Prerequisite: Fr. 21. Not given in 1933-1934. Second semester (3). Professor Fox.

For Graduates

Prerequisites: Graduate students who major in French must have completed not less than twelve semester hours of French language and literature above the standard intermediate courses. A reading knowledge of Latin and German is desirable; a general knowledge of English literature is required.

Fr. 201. OLD FRENCH. Grammar, Schwan-Behrens. Earlier texts. *Chanson de Roland*. First semester (3). Associate Professor Toohy.

Fr. 202. OLD FRENCH. Continuation of Fr. 201. Second semester (3). Associate Professor Toohy.

Fr. 251. THE HISTORY OF THE NOVEL IN FRANCE. This course traces the growth of the novel as a form of literature and its various transformations. A number of the representative masterpieces of different periods are read, and both their technical qualities and their relation to the social and intellectual environments are studied. Particular attention is given to the preparation and development of realism in the nineteenth century. First semester (3). Assistant Professor Brown.

Fr. 252. THE HISTORY OF THE REALISTIC NOVEL IN FRANCE. Continuation of Fr. 251. Second semester (3). Assistant Professor Brown.

Fr. 255. FRENCH SOCIAL FORCES. As exemplified in modern French literature. First semester (3). Mr. Scott.

Fr. 256. FRENCH SOCIAL FORCES. Continuation of Fr. 255. Second semester (3). Mr. Scott.

SPANISH

Span. 1. ELEMENTARY SPANISH. First semester (3).

Span. 1a. ELEMENTARY SPANISH. Six hours supervised study and one hour prepared recitation. First semester (3).

Span. 2. ELEMENTARY SPANISH. Continuation of Span. 1. Prerequisite: Span. 1 or the equivalent. Second semester (3).

Span. 2a. ELEMENTARY SPANISH. Continuation of Span. 1a. Six hours supervised study and one hour prepared recitation. Second semester (3).

By permission of the instructor in charge, Span. 1a and 2a may be substituted for Span. 1 and 2.

Span. 11. INTERMEDIATE SPANISH. Continuation of Span. 2. Prerequisite: Span. 1 and 2. First semester (3).

Span. 12. INTERMEDIATE SPANISH. Continuation of Span. 11. Second semester (3).

Span. 21. SPANISH NOVELS AND PLAYS. Continuation of Span. 12. Prerequisite: Span. 11. First semester (3).

Span. 22. SPANISH NOVELS AND PLAYS. Continuation of Span. 21. Prerequisite: Span. 11. Second semester (3).

Span. 93. SPANISH ORAL COMPOSITION. A course for students who wish a greater opportunity to practice in the oral and written use of Spanish prose. Especially recommended for those who expect to teach Spanish. Prerequisite: permission of instructor in charge of course. First semester (3).

Span. 94. SPANISH ORAL COMPOSITION. Continuation of Span. 93. Second semester (3).

For Advanced Undergraduates and Graduates

Span. 135. SPANISH-AMERICAN LITERATURE. Social and historical forces in the Spanish-American republics as exemplified in the modern literature of those countries. Prerequisite: Span. 21. First semester (3). Assistant Professor Soto.

Span. 136. SPANISH AMERICAN LITERATURE. Continuation of Span. 135. Prerequisite: Span. 21. Second semester (3). Assistant Professor Soto.

Span. 141. SPANISH FICTION OF THE SIXTEENTH AND SEVENTEENTH CENTURIES. Study of the novel in the golden age of Spanish literature, especially of Cervantes' *Don Quixote*. Collateral reading in modern Spanish prose dealing with the subject of the course, and reports. Prerequisite: Span 21. First semester (3). Assistant Professor Soto.

Span. 142. SPANISH DRAMA OF THE SIXTEENTH AND SEVENTEENTH CENTURIES. Plays of Lope de Vega, Tirso de Molina, and Calderón. Collateral reading in modern Spanish prose dealing with the subject of the course, and reports. Prerequisite: Span. 21. Second semester (3). Assistant Professor Soto.

Span. 143. SEMINAR. A study of the works of some author or group of authors or of a period. Prerequisite: Span. 21. First semester (3). Assistant Professor Soto.

Span. 144. SEMINAR. Continuation of Span. 143. Prerequisite: Span. 21. Second semester (3). Assistant Professor Soto.

For Graduates

Prerequisites: Graduate students who major in Spanish must have completed not less than twelve semester hours of Spanish language and literature above the standard intermediate courses. A reading knowledge of Latin and French is desirable.

Span. 201. OLD SPANISH. Ford's *Old Spanish Readings*. First semester (3). Assistant Professor Soto.

Span. 202. OLD SPANISH. Continuation of Span. 201. Second semester (3). Assistant Professor Soto.

Span. 251. THE MODERN SPANISH NOVEL. Works of Galdós, Alarcón, Valera, Pereda, Valdés, Pardo Bazán, Blasco Ibáñez, Valle Inclán, Baroja. Reading, reports, and lectures. Given in 1932-1933. First semester (3). Assistant Professor Soto.

Span. 252. THE MODERN SPANISH NOVEL. Continuation of Span. 251. Second semester (3). Assistant Professor Soto.

ITALIAN

Ital. 1. ELEMENTARY ITALIAN. Grammar and composition; rapid reading of easy modern prose. First semester (3).

Ital. 2. ELEMENTARY ITALIAN. Continuation of Ital. 1. Second semester (3).

Ital. 11. INTERMEDIATE ITALIAN. Masterpieces of classic periods. Outside reading. Prerequisites: Ital. 1 and 2. First semester (3).

Ital. 12. INTERMEDIATE ITALIAN. Continuation of Ital. 11. Second semester (3).

THE LEHIGH UNIVERSITY BAND

Band may be elected by suitably qualified freshmen and sophomores in place of Military Science and Tactics. It is an optional subject for suitably qualified juniors and seniors. The band is drilled according to the methods prescribed for regular army bands by one of the sergeants designated for that purpose by the head of the department of Military Science and Tactics.

The band is required to participate in military ceremonies when called upon by the professor of Military Science and Tactics, and also to attend all football games played at home and not more than ten other home games, to be specified by the graduate manager of athletics. When it appears for military ceremonies the band is to be considered an integral part of the R.O.T.C. regiment.

Coat and cap of uniform, musical instruments, and music are furnished by the University. Members of the band furnish white flannel trousers. A deposit of \$25.00 is required from each member of the band for an instrument or uniform.

Seniors and juniors who qualify for membership in the band may substitute band work for the requirement in physical education; sophomores and freshmen may substitute band work for the requirements in physical education and in military science and tactics. Credit is not given during any semester for both band and either of the above-named subjects. Students desiring to play in the band as volunteers may do so, if qualified, and are entitled to the awards named in the following paragraph:

In addition to the above credits, one year of satisfactory service in the band entitles a student to a watch fob; two years of service, a sweater; three years, \$20.00 in cash; and four years, an additional \$20.00 in cash.

SUMMER SESSION

The various courses given during the summer are administered by the director of the summer session and a faculty consisting of those teaching in the summer session. All courses are conducted in accordance with the same standards, and may be credited towards a degree on the same basis, as courses given in the first and second semesters. Women are admitted to the summer session either as graduate or as undergraduate students on the same terms as men. Certificates of academic credit are issued, on request, for all courses satisfactorily pursued.

The courses offered during the summer session are arranged in three distinct groups: (1) courses which are an integral part of certain engineering curricula; (2) courses in a large variety of subjects offered primarily for undergraduates who wish to secure advanced credits or to make up deficiencies; (3) professional courses designed primarily for teachers.

The following courses were offered in the summer of 1932. The Summer Session Announcement, containing full description of courses to be offered in 1933, and information concerning admission, fees, etc., will be sent to any address on request.

REQUIRED COURSES IN ENGINEERING

June 6 to July 2

Chem. 39	Assaying, Coal, Gas, and Oil Analysis.....	(4)
C.E. 6	Land and Topographic Surveying.....	(4)
M.E. 24	Engineering Laboratory	(4)
	July 5 to July 16	
C.E. 7	Railroad Surveying	(2)

OPTIONAL COURSES

July 5 to August 13

Astr. 1	Descriptive Astronomy	(3)
Bus. 1	Industrial Evolution	(3)
Bus. 2	Industrial Evolution	(3)
Bus. 3	Economics	(3)
Bus. 4	Economics	(3)
Bus. 18	Accounting	(3)

Bus. 161	Sociology	(3)
Chem. 1	Elementary Chemistry	(2)
Chem. 3	Intermediate Chemistry	(2)
Chem. 6	Advanced Chemistry	(3)
Chem. 8	Stoichiometry	(1)
Chem. 11	Chemistry Laboratory	(2)
Chem. 12	Chemistry Laboratory	(1)
Chem. 20	Qualitative Analysis	(3)
Chem. 21	Qualitative Analysis	(2)
C.E. 1	Engineering Drawing	(2)
C.E. 2	Engineering Drawing	(2)
C.E. 8	Mechanics of Materials.....	(4)
C.E. 9	Mechanics of Materials.....	(3)
C.E. 12	Hydraulics	(3)
C.E. 13	Hydraulics	(2)
C.E. 15	Structural Theory: Stresses.....	(4)
E.E. 2	Direct Current Machinery	(3)
E.E. 3	Dynamo Laboratory, Elementary.....	(1)
E.E. 5	Dynamo Laboratory, Intermediate, Direct Cur- rent	(1)
E.E. 6	Alternating Currents, Advanced	(3)
E.E. 8	Dynamo Laboratory, Intermediate, Alternating Current	(2)
E.E. 50	Dynamos and Motors, General.....	(2)
E.E. 52	Alternating Currents, General	(2)
Engl. 1	Composition and Literature.....	(3)
Engl. 2	Composition and Literature.....	(3)
Engl. 100	Greek Literature in English Translation.....	(3)
Engl. 117	Contemporary Drama	(3)
Engl. 121	Contemporary Literature	(3)
Engl. 123	Shakespeare	(3)
Engl. 220	Graduate Seminar	(3)
Fr. 12	Intermediate French	(3)
Fr. 255	French Social Forces	(3)
Govt. 156	International Law	(3)
Govt. 157	Problems of Municipal Management.....	(3)
Hist. 120	Seminar	(3)
Hist. 226	Pennsylvania History	(3)
Math. 1	Plane Trigonometry	(3)
Math. 2	Algebra	(3)
Math. 3	Analytic Geometry	(3)
Math. 4	Elementary Calculus	(3)
Math. 5	Intermediate Calculus	(3)
Math. 6	Advanced Calculus	(3)
Math. 16	Solid and Spherical Geometry and Spherical Trigonometry	(3)
Math. 20	Elementary Mechanics	(4)
Math. 21	Analytic Mechanics	(3)
M.E. 1	Elementary Machine Design	(3)
M.E. 2	Elementary Heat Engines	(3)

M.E. 4	Elementary Machine Design.....	(3)
M.E. 5	Heat Engines	(3)
Phil. 3	Introduction to Philosophy.....	(3)
Phil. 102	History of Philosophy, Mediaeval and Modern. (3)	
Phil. 202	History of Philosophy, Advanced, Modern..... (3)	
Phys. 1	Elementary Physics	(4)
Phys. 4	Mechanics, Light and Sound.....	(3)
Phys. 5	Physics Laboratory	(1)
Phys. 6	Electricity, Magnetism, and Heat.....	(3)
Phys. 7	Physics Laboratory	(1)
Phys. 12	General Physics	(3)
Phys. 13	General Physics	(3)
Psych. 1	Elementary Psychology	(3)
Psych. 15	Applied Psychology	(3)
Span. 2	Elementary Spanish	(3)

PROFESSIONAL COURSES FOR TEACHERS

July 5 to August 13

Educ. 3	Educational Psychology	(3)
Educ. 103	Advanced Educational Psychology	(3)
Educ. 116	Education of Exceptional Children.....	(3)
Educ. 211	History of Education, Advanced Course.....	(3)
Educ. 213	Educational Systems in America and Europe..	(3)
Educ. 217	Principles of Education	(3)
Phil. 111	Theory of Education	(3)

LEHIGH INSTITUTE OF RESEARCH

The Lehigh Institute of Research was organized in 1924 to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the University, and in recognition of the need for further and more exact knowledge in science and in the applications of science to the affairs of modern life.

The purposes of the Institute of Research include (1) the training of men for research work, (2) the publication of the results of investigations, (3) the conduct of general research, (4) the conduct of cooperative research, (5) the conduct of commercial tests and advisory service.

Detailed information concerning the organization and regulations of the Institute of Research are given in a pamphlet which will be furnished on request.

BUILDINGS AND GROUNDS

The University occupies nineteen buildings and its grounds cover one hundred eighty acres on the north side of South Mountain, overlooking the valley of the Lehigh River and the city of Bethlehem.

PACKER HALL

Packer Hall is a four-story sandstone building, 215 feet long and 60 feet wide.

The department of Civil Engineering occupies the greater part of the first and second floors. The instrument rooms contain transits, levels, a large geodetic theodolite, plane tables, and other instruments for engineering field work. In the department headquarters is a collection of plans of engineering structures.

The departments of Mathematics and Astronomy, Philosophy, Education, and Psychology are located in this building. The psychology laboratory has the standard equipment for the several courses in experimental psychology and for special research.

THE WILLIAM H. CHANDLER CHEMISTRY LABORATORY

The Chemistry Laboratory is a fire-proof sandstone building, 259 feet long and 44 feet wide, with a wing 62 feet long and 42 feet wide, and with a three-story extension 60 feet long and 37 feet wide.

Laboratory space and equipment are provided for qualitative and quantitative analysis, inorganic chemistry, organic chemistry, sanitary chemistry, industrial biochemistry, colloid chemistry, X-ray analysis, gas analysis, the furnace assay of ores, industrial chemistry, and research in chemistry and chemical engineering. A chemistry museum is located in this building.

The trustees of the University named this building the William H. Chandler Chemistry Laboratory in recognition of Dr. Chandler's thirty-five years' service as professor of Chemistry, 1871-1906.

THE PHYSICS LABORATORY

The Physics Laboratory is a four-story sandstone building, 240 feet long and 44 to 56 feet wide. This building is devoted entirely to the department of Physics. Apparatus and other facilities are provided for lecture and laboratory instruction and research. In addition to offices, recitation rooms, and lecture rooms there are several large laboratory rooms, a reading room, machine shop, wood working shop, glass-blowing room, constant-temperature rooms, storage battery room, sound-proof rooms, dark rooms, and several research laboratories. The building is equipped throughout with water, gas, compressed air, and electric power outlets.

**THE W. A. WILBUR ENGINEERING LABORATORY
AND POWER HOUSE**

The W. A. Wilbur Engineering Laboratory and Power House is a two-story sandstone building, 188 feet long and 44 feet wide.

The power plant contains three Babcock and Wilcox straight-tube cross-drum boilers, each rated at 300 boiler horse power; three Coxe chain grate stokers, two turbine-driven Sturtevant blowers, and coal, water, and ash handling equipment of modern design. The plant is designed and equipped to provide steam at 250 lbs. pressure to the engineering laboratories, in addition to heating the University buildings. It is so arranged that any boiler can be isolated for laboratory tests for long periods if necessary. From this plant a six-inch line carries steam to the Packard Laboratory at the pressure desired for the laboratory work. Modern safety appliances and measuring equipment have been incorporated.

A coal-storage yard has room for a season's supply of coal, and a system of belt conveyors and bucket-elevators is provided for receiving coal, dumping it on storage pile, and conveying it into the boiler room as needed.

A floor space of 45 feet by 70 feet in the Wilbur Engineering Laboratory is used for the large equipment of the department of Chemical Engineering.

WILLIAMS HALL

Williams Hall, the donation of Dr. Edward H. Williams, jr., of the Class of '75, was so named by the trustees of the University in recognition not only of this gift but also of Dr. Williams' long continued and important service to the University as an alumnus and as professor of Mining and Geology.

Williams Hall is a three-story brick building, 186 feet long and 70 feet wide. It contains the offices, class rooms, laboratories, departmental libraries, and museum collections of the departments of Metallurgical Engineering, Geology, and Biology.

THE FRITZ ENGINEERING LABORATORY

The late John Fritz, of Bethlehem, known as the father of the steel industry in the United States, a member of the original Board of Trustees of the University, gave to the University funds for the erection and thorough equipment of an engineering laboratory. The building was designed and erected under the personal supervision of Mr. Fritz. The building is equipped with a general testing section for testing iron and steel, a cement and concrete section, and a hydraulics section. The equipment is used by the Civil Engineering department in connection with courses in mechanics of materials, hydraulics, and cement and concrete.

The Fritz Engineering Laboratory is of modern steel frame construction, 115 feet long and 94 feet wide, with the main central section 65 feet in height, and two side sections of lesser height. An electrically-operated traveling crane, of 10-ton capacity, commands the entire central portion of the building in which the testing of large specimens is carried on.

The general testing section is equipped with an 800,000-pound Riehlé vertical screw testing machine, capable of testing columns 25 feet long or less, tensile specimens 20 feet long or less, and transverse specimens up to lengths of 30 feet; an Olsen universal testing machine of 300,000 pounds capacity; smaller machines for ordinary tension, compression, transverse, and torsion tests; a cold-bend testing machine, impact and fatigue machines, and a small machine shop.

The hydraulics section is equipped with various tanks, weirs, pumps, and other apparatus for studying problems in hydraulics. The cement and concrete section has a large room for the making and testing of specimens and a room for the storage of materials.

THE ECKLEY B. COXE MINING LABORATORY

The Eckley B. Coxe Mining Laboratory is a sandstone building, 100 feet long and 75 feet wide. It is occupied exclusively by the department of Mining Engineering.

During the summer of 1930, the timber framing which supported much of the machinery was removed, and two new steel-concrete floors were constructed entirely within the original walls, thus practically doubling the available floor space.

The building contains the office of the professor of Mining Engineering, the main lecture room, a locker and wash room, the office of the professor of Ore Dressing and Fuel Technology, a laboratory equipped for fuel research, a balance room, a sampling laboratory and shop.

On the lower main floor are two air compressors, rock drills, a large concentrating table, a Chance coal cleaner, and a motor-generator set. The upper main floor contains a gyratory crusher, rolls, stamp mill, jigs for coal and ore, concentrating table, vanner, and centrifugal roller-mill.

The lower second floor is equipped as a fuel technology laboratory, with chemical work tables and apparatus for coal, gas, and oil analysis, combustion, calorimetry, pyrometry, coal and oil distillation. The upper second floor is arranged for laboratory work in ore dressing and coal preparation. The equipment comprises two magnetic separators, a rod mill, a jig, three types of flotation machines, a small laboratory concentrating table, a small bowl classifier, and a suction filter. A small mine-type ventilating fan with ducts permits air current measurements. A portion of this floor is also used for mine surveying map work.

The laboratory was named by the trustees of the University in memory of Eckley B. Coxe, who was a pioneer and a leader in the profession of mining engineering in this country, and an active friend and valued trustee of the University from its early days until his death.

CHRISTMAS-SAUCON HALL

During the summer of 1926, Christmas and Saucon Halls were remodelled and joined by the addition of a four-story central building.

Christmas Hall has historic interest as the first building of Lehigh University. It was originally a church, which was purchased from the Moravian congregation. In the earliest years of the University it contained a chapel, lecture rooms, and students' dormitory.

Christmas-Saucon Hall contains the office of the College of Business Administration, the offices, lecture rooms, and recitation rooms of the departments of English and of Economics, Sociology, and Business Administration, and the offices and dispensary of the Students' Health Service.

COPPEE HALL

Coppée Hall is the headquarters of the College of Arts and Science. It contains the offices of the College of Arts and Science, a lecture room, and the offices and recitation rooms of the departments of German, Latin, Greek, Romance Languages, History and Government, and Fine Arts.

SAYRE OBSERVATORY

The Sayre Observatory was the gift of the late Robert H. Sayre, one of the original trustees of the University.

The Observatory contains an equatorial telescope of six inches clear aperture and of eight feet focus, by Alvin Clark; a zenith telescope of four and one-half inches clear aperture; an astronomical clock, by William Bond & Son; a meridian circle; a prismatic sextant, by Pistor and Martins; an engineer's transit and a sextant, by Buff and Buff. Students in practical astronomy receive instruction in the use of the instruments and in observation.

The land upon which the Observatory stands, consisting of seven acres adjoining the original grant, was presented to the University by the late Charles Brodhead, of Bethlehem.

THE PACKER MEMORIAL CHURCH

The Packer Memorial Church, in which daily chapel exercises are held, was the gift of the late Mrs. Mary Packer Cummings, daughter of the Founder of the University. It was built in 1887.

THE UNIVERSITY LIBRARY

The original Library building was erected by the Founder of the University in 1877 as a memorial to his daughter, Mrs. Lucy Packer Linderman. The present Library, constructed on three sides of the original building, is in the collegiate Gothic style of architecture. It contains five times the floor space of the old structure and affords shelving capacity for approximately 500,000 volumes. Space is provided in the reading room and seminars and other special rooms for about 500 readers. Adequate space for the cataloging departments and other purely administrative functions of the library is provided, together with special rooms for the treasure collection, the Lehigh collection, the geography collection, and the art collection. Eleven seminar rooms are provided for advanced study. The building contains a browsing room and an art gallery. Individual cubicles are provided in the stacks for advanced students and research workers.

202,000 volumes are now upon the shelves. The list of current periodicals numbers about seven hundred. The Library is especially rich, for one of its size, in materials for research in history, American newspapers, and the history of early science, and in the files of technical journals. The Library is a depository for government documents.

Small working reference collections for laboratory use are maintained by the departments of Biology, Geology, Chemical, Civil, Mechanical, and Mining Engineering.

The Library is open from 8 a.m. to 10 p.m., except on Sundays and holidays.

The use of the library, with privilege of borrowing books, is offered to all members of the University: faculty, students, and alumni. Students are allowed free access to the books and are encouraged to become familiar with methods of using a library for literary and scientific work. The privileges of the library are also extended to all qualified residents of the city. The library offers its services to the industries located in the community.

The Eckley B. Coxe Memorial Collection

In memory of Eckley B. Coxe, for many years a trustee of the University, Mrs. Coxe presented to the University his

technical library, consisting of 727 volumes and 3429 pamphlets. As the working library of a man who was remarkable for the extent and thoroughness of his acquaintance with the whole field of applied science, this collection possesses great value for scientific and engineering students.

The Joseph W. Richards Collection

The Joseph W. Richards Library of Metallurgy and Chemistry, consisting of about 3000 volumes, is located on the second floor of Williams Hall, and is open for use under the supervision of the department of Metallurgy.

TAYLOR HALL

Taylor Hall, the gift of Mr. Andrew Carnegie, is a concrete dormitory with accommodations for 137 students. There are suites of three rooms (a study and two adjacent bedrooms), for two occupants, and a few single rooms. The building was named Taylor Hall by Mr. Carnegie in honor of Mr. Charles L. Taylor, his former partner in business, a graduate of the University in the class of 1876, and a trustee of the University. The rates for the suites of rooms are \$100.00 or \$120.00 a year for each occupant. The single rooms are \$50.00, \$65.00, or \$80.00 a year.

PRICE HALL

Price Hall furnishes dormitory accommodations for thirty-four students. It was named in honor of Dr. Henry R. Price, an alumnus of the University of the class of 1870, late President of the Board of Trustees.

DROWN MEMORIAL HALL

Drown Memorial Hall was erected by friends and alumni as a memorial to the late Thomas Messinger Drown, LL.D., President of the University from 1895 to 1904. The building is devoted to the social interests of the University students. It contains study, reading, and lounging rooms, an assembly hall, and the offices of the Lehigh University Union, the Board of Control of Athletics, the college publications, and the dramatic and musical organizations. A cafeteria is located in the basement.

ALUMNI MEMORIAL BUILDING

The Alumni Memorial Building was erected as a memorial to the more than 1900 Lehigh men who served in the World War, and especially to the forty-six who gave their lives. The cost of erection was raised by subscription from about 1700 alumni. It is used as the administration building of the University. The Memorial Hall contains the records of the Lehigh men who served and those who died, together with mementos of the war.

In the south wing of the building are the offices of the President, the Dean, and the Registrar of the University. There is also a large faculty committee room in this wing. The north wing contains the offices of the Vice-President and Comptroller, the Treasurer, and the Bursar, the offices of the Alumni Association, the University Supply Bureau, also a large room used for faculty meetings, receptions, dances, the annual meeting of the Alumni Association, and meetings of the Alumni Council.

TAYLOR GYMNASIUM AND FIELD HOUSE

In 1913 Mr. Charles L. Taylor, a graduate of the University of the class of 1876 and a member of the Board of Trustees, donated to the University the funds required for the erection of a gymnasium and a field house.

Taylor Gymnasium adjoins the athletic field. The building is 222 feet long and 73 feet wide. On the ground floor is located the game room, 93 by 70 feet, used for basketball and wrestling. The game room is surrounded by a gallery for spectators. The main gymnasium floor measures 90 by 70 feet. Other rooms in Taylor Gymnasium are the offices and measuring room of the department of Physical Education, a large trophy room, basketball and handball courts, fencing, boxing, and wrestling rooms, and locker rooms with accommodations for the entire student body.

The gymnasium is equipped with modern appliances for recreative and corrective exercises, also with apparatus for calisthenics and other gymnastics, both for individual and for class work. In addition to numerous hot and cold shower baths, adjoining the locker rooms is a swimming pool, 75 by 25 feet, with a depth from $4\frac{1}{2}$ feet to $9\frac{1}{2}$ feet. The capacity of the swimming pool is 95,000 gallons.

Adjoining the gymnasium and the stadium is the Taylor field house. It is two stories in height, and has dressing rooms, lockers, and shower baths for visiting and Lehigh teams.

TAYLOR FIELD

An athletic field of more than nine acres in area is provided for the accommodation of students who participate in the various outdoor sports. The Stadium, located on the lower level, provides football and baseball fields. It is surrounded by concrete stands having a seating capacity for 12,000 spectators. On the upper level there is a practice field for football, baseball, lacrosse, and soccer; also a quarter mile track and a 220-yard straightaway. During the winter months a wooden outdoor running track, twelve laps to the mile, is provided.

LEHIGH FIELD

An additional athletic field of ten acres in area, with field house and covered grandstand, is located about a mile from the University campus. This field is used for intercollegiate tennis and soccer, and for intramural athletic activities.

ARMORY

The Armory contains the offices, class rooms, storage rooms, and indoor rifle and pistol range of the department of Military Science and Tactics.

THE JAMES WARD PACKARD LABORATORY OF ELECTRICAL AND MECHANICAL ENGINEERING

The late James Ward Packard, who was graduated from Lehigh University in 1884 with the degree of Mechanical Engineer, the designer of the first Packard motor car, the founder of the Packard Motor Car Company of Detroit, Michigan, and of the Packard Electric Company of Warren, Ohio, donated \$1,200,000.00 for the erection and equipment of an electrical and mechanical engineering laboratory.

The Packard Laboratory, occupied in the fall of 1929, is a five-story steel-framed sandstone building 225 feet long and 180 feet wide. The lobby is finished in Italian travertine. The halls throughout the building are wainscoted with Tennessee marble. An auditorium on the first floor with a

seating capacity of 622 is equipped with a moving picture machine and a projection lantern.

The western half of the James Ward Packard Laboratory is devoted to the work of the department of Electrical Engineering. The eastern half of the building houses the department of Mechanical Engineering with offices, drawing rooms, class rooms, research rooms, reading and study room, shops, instrument rooms, and laboratories.

SAYRE PARK

A development of the mountain side of the University grounds was effected through the donation to the University in 1909 of the sum of \$100,000.00 by the children of the late Robert H. Sayre, to be used in the development of Sayre Park as a memorial to their father, who was a trustee of the University from its foundation in 1866 to his death in 1907.

THE ARBORETUM

The Arboretum is a tract of about eleven acres adjoining Sayre Park. It was established by a friend of the University as a tree nursery for the purpose of furnishing illustrative specimens of American trees, and of cultivating trees and shrubs for the beautifying of the park. All of the more important species of North American trees are to be found in the University park and the arboretum. Adjoining the Arboretum a tract of seven acres has been planted with a variety of indigenous trees as an exhibition growth of tree culture.

SCHOLARSHIPS

UNIVERSITY SCHOLARSHIPS

The following scholarships are awarded annually:

1. Six free and ten deferred tuition scholarships to freshmen, each of whom has shown that
 - (a) He is in need of financial assistance;
 - (b) He attained an average scholastic record which placed him in the highest third of his class in the high school or preparatory school from which he was graduated;

(c) His character and personality are such as to give promise that he will profit by a college education.

2. Eighteen free and thirty deferred tuition scholarships to students above the grade of freshman, each of whom has completed at least one year's work at the University and has shown that

(a) He is in need of financial assistance;

(b) He secured during the previous academic year an average grade of 2.00 or higher.

(c) His character and personality are such that the University may properly assist him.

3. Thirty-six deferred tuition scholarships to students in any class, subject to the foregoing requirements.

4. Twenty-four deferred tuition scholarships in the award of which prospective school teaching is considered as a factor in addition to the foregoing requirements.

Interest at the rate of 6% on notes for deferred tuition begins on the day the student is graduated or withdraws from the University.

Deferred tuition notes are payable in monthly installments beginning three months after a student's graduation or withdrawal from the University, at the rate of \$15.00 a month during the first year and \$20.00 a month thereafter.

In no case is a scholarship awarded for more than one academic year in advance.

Applications for scholarships are considered by the committee on Scholarships and Loans on July first of each year. Applicants for freshman scholarships must submit, prior to July first, records of their academic work and statements concerning their relative class standing from the principals of the schools they have attended.

THE WILBUR SCHOLARSHIP

The Wilbur Scholarship, founded in 1872 by the late E. P. Wilbur, provides the sum of \$200.00 which is awarded annually to the sophomore with the best record for the sophomore year.

THE HENRY S. HAINES MEMORIAL SCHOLARSHIP

Mrs. Henry S. Haines, of Savannah, Ga., established in 1889 a scholarship of the annual value of \$200.00 as a memorial to her son, Henry Stevens Haines, M.E., a member of the class of 1887. By terms of the bequest this scholarship is awarded to a student in the curriculum in Mechanical Engineering. The requirements governing the award of University scholarships apply likewise to this scholarship.

THE FRED. MERCUR MEMORIAL FUND SCHOLARSHIPS

Friends of the late Frederick Mercur, of Wilkes-Barre, Pa., General Manager of the Lehigh Valley Coal Company, desiring to establish a memorial of their friendship and esteem, and to perpetuate his memory, contributed and placed in the hands of the trustees of the University a fund called the Fred. Mercur Memorial Fund. The income from this fund, amounting to \$600.00 annually, is awarded to students of the University. The requirements governing the award of University scholarships apply likewise to these scholarships.

THE RAY SANDS NOSTRAND SCHOLARSHIP

The Ray Sands Nostrand Scholarship was established by the late Benjamin B. Nostrand, jr., M.E., '78, in memory of his son, Ray Sands Nostrand, '17. The income from this fund, amounting to \$500.00 annually, is awarded to students of the University. The requirements governing the award of University scholarships apply likewise to this scholarship.

ENDOWED SCHOLARSHIPS

Undergraduate scholarships named to honor an individual or corporation may be established in perpetuity through the payment to the Board of Trustees of Lehigh University of \$10,000.00. The income from this donation will be paid to the holder of the scholarship to be applied towards the payment of University fees. The University does not, however, guarantee that this income will be forever sufficient to pay such fees in full.

FINANCIAL AID

LOANS

A student who gives satisfactory evidence of his inability to pay his expenses may apply for aid from the loan funds of the University. A student to whom a loan is granted gives a note also signed by his parent or guardian, bearing interest at the legal rate from the date of the loan, and payable at some fixed date agreed upon. The granting of a loan is based on a knowledge of the needs of each applicant; the decision in each case is determined by all available information, and such information is treated as confidential.

The committee on Scholarships and Loans must be thoroughly convinced of the student's inability to pay his expenses; if it is found that an application is made as a matter of convenience to avoid the necessity of earnest effort on the part of the applicant or of his parents to obtain the necessary money from relatives or friends or from a bank, the committee will consider such information as ground for the refusal of a loan.

The committee may at any time require from a student to whom a loan is granted a statement of his expenses while at the University. Expenditures above what is necessary for books, instruments, and laboratory fees, and for suitable but inexpensive board and lodging, or the possession of an automobile for use at the University, will be considered as evidence that the student's circumstances are not in accord with his statement that it is impossible for himself or his parents to pay or provide for his expenses.

A loan is granted, as a rule, only to a student who has made a good record in the University. A loan is not ordinarily granted to a student during his first year of attendance.

THE ECKLEY B. COXE MEMORIAL FUND

In memory of the late Eckley B. Coxe, trustee of the University, Mrs. Coxe established a fund, now amounting to \$66,497.87, the interest of which is used, under the direction of the trustees of the University, and subject to such regulations as they may adopt, for the assistance of worthy students requiring financial aid.

THE FRANK WILLIAMS FUND

Frank Williams, B.S., '87, E.M., '88, who died in October, 1900, bequeathed to the University the greater part of his estate to found a fund, now amounting to \$166,566.74, the income of which is lent to deserving students.

THE PRESIDENT'S FUND

The President's Fund was established during the early years of the University for the help of deserving students. As payments are made by former beneficiaries they are immediately available for the assistance of students of the University.

THE FRAZIER AND RINGER MEMORIAL FUND

The Frazier and Ringer Memorial Fund was established in 1906 by the late Robert H. Sayre, in memory of Benjamin West Frazier, A.M., Sc.D., former professor of Mineralogy and Metallurgy, and Severin Ringer, U.J.D., former professor of Modern Languages and Literature and of History, each of whom served Lehigh University for one-third of a century. The income of this fund, which now amounts to \$4,611.71, and payments made by former borrowers are available for loans to cover the medical and surgical care of worthy students.

RESEARCH FELLOWSHIPS

Applications for appointment to the following research fellowships may be submitted by graduates in engineering or science of colleges, universities, and technical schools whose requirements for graduation are substantially the same as those at Lehigh University. Applications should be sent to the President of Lehigh University, Bethlehem, Pa., on or before March 1. Each application for a fellowship should be accompanied by a catalogue of the institution from which the applicant was graduated, a certificate of his college work, a statement concerning his practical experience, and any other evidence of his qualifications for the position which he may choose to submit. An applicant must indicate the line of graduate study he desires to undertake and his special qualifications for such work.

Holders of fellowships, who also pursue graduate work at the University, are exempt from the payment of the University tuition fee. Holders of fellowships are not permitted to accept any kind of employment for pay during the period covered by their appointments.

NEW JERSEY ZINC COMPANY RESEARCH FELLOWSHIP

The New Jersey Zinc Company provided funds in 1924 for a research fellowship to be known as the New Jersey Zinc Company Research Fellowship, which is administered under the following regulations:

Appointment to this fellowship is for the period of two academic years, beginning September 1 and ending June 30, with an annual stipend of \$600.00 payable in ten installments. Half of the time of the holder of this fellowship must be devoted to research work in the department to which he is assigned; the other half to graduate study leading to a master's degree at the end of the two year appointment provided all University requirements for this degree have been satisfied. The holder of this fellowship is required to devote approximately ninety hours a month independently of University holidays to research work assigned to him in the department to which he is attached.

THE HENRY MARISON BYLLESBY MEMORIAL RESEARCH FELLOWSHIPS

In 1926 Mrs. H. M. Byllesby, widow of Col. H. M. Byllesby, M.E., '75, President of the Byllesby Engineering and Management Corporation, provided an endowment fund for the establishment of the Henry Marison Byllesby Memorial Research Fellowships in Engineering. The income provides for two fellowships which carry an annual stipend of \$750.00, payable in ten monthly installments.

Appointments are for two academic years. Half of the time of the holders of these fellowships must be devoted to research work on some problem in electrical, mechanical, or hydraulic engineering, proposed by the President of the Byllesby Engineering and Management Corporation and approved by the Lehigh Institute of Research; the other half to graduate study leading to the degree of Master of Science

at the end of the two year appointment, provided all University requirements for this degree have been satisfied.

**THE JAMES WARD PACKARD RESEARCH FELLOWSHIP IN
ELECTRICAL OR MECHANICAL ENGINEERING**

The income from a bequest from James Ward Packard, M.E., '84, provides for a research fellowship in either electrical or mechanical engineering, with an annual stipend of \$600.00 for each of two years of ten months covered by an appointment.

**THE C. KEMBLE BALDWIN RESEARCH FELLOWSHIP IN
AERONAUTIC ENGINEERING**

A fund provided by Mrs. C. Kemble Baldwin as a memorial to her husband, C. Kemble Baldwin, M.E., '95, provides for the occasional appointment of a research fellow in any branch of science having a bearing on the field of aeronautics, with a stipend of \$750.00 a year for each of two years of ten months covered by an appointment.

**THE HUNT-RANKIN LEATHER COMPANY RESEARCH
FELLOWSHIPS IN LEATHER TECHNOLOGY**

The Hunt-Rankin Leather Company has established two research fellowships in leather technology, with a stipend of \$900.00 each, payable in twelve installments.

**THE LAWRENCE CALVIN BRINK RESEARCH FELLOWSHIP
IN CIVIL ENGINEERING**

A fund provided by the late Mrs. L. C. Brink as a memorial to her husband, Lawrence Calvin Brink, C.E., '94, provides for the occasional appointment of a research fellow in civil engineering with a stipend of \$600.00 a year for each of two years of ten months covered by an appointment.

**THE ARCHER-DANIELS-MIDLAND COMPANY AND THE
WILLIAM O. GOODRICH COMPANY RESEARCH
FELLOWSHIPS**

Four research fellowships, carrying an annual stipend of \$900.00 each, were established in the fall of 1927 by the Archer-Daniels-Midland Company, of Minneapolis, Minn., and the William O. Goodrich Company, of Milwaukee, Wis., for research in linseed and other drying oils.

THE STUDENT CHEMISTRY FOUNDATION

In the spring of 1927 members of the class of 1930 established the Student Chemistry Foundation in honor of Harry M. Ullmann, head of the department of Chemistry. This fund provides two research fellowships, for which Lehigh University graduates only are eligible, carrying an annual stipend of \$750.00 each.

THE LEHIGH INSTITUTE OF RESEARCH FELLOWSHIPS

Seven fellowships have been established by the trustees of the University, for research in various fields of science and technology. Appointments to these fellowships are for a period of two years of ten months each. The stipend is \$600.00 annually.

THE EAVENSON AND LEVERING COMPANY RESEARCH FELLOWSHIP

The Eavenson and Levering Company has established a research fellowship for the study of wool, with a stipend of \$750.00 for one year, beginning September 1, 1932.

THE GARRETT LINDERMAN HOPPES RESEARCH FELLOWSHIP IN CIVIL ENGINEERING

A research fellowship in Civil Engineering was established by the late Mrs. Maria B. Hoppes in memory of her son, the late Garrett Linderman Hoppes, C.E., '83. Appointments to this fellowship are for a period of two years of ten months each. The stipend is \$600.00 annually.

ENDOWED FELLOWSHIPS

Research fellowships named in honor of an individual or a corporation offering opportunities for graduate work and training in research in any designated field of study may be established in perpetuity through the payment to the Board of Trustees of \$20,000.00. The income from this fund will be paid to the holder of the fellowship after the deduction of his tuition and laboratory fees. If a bequest for the establishment of a fellowship provides for half-time service as a research assistant in the Institute of Research, the remaining time to be devoted to graduate study, the University will remit the tuition fee and make only such charges against the fund as are necessary to cover the cost of materials, supplies, and apparatus that need to be provided for the work of the fellow.

PRIZES

THE WILBUR PRIZES

A fund was established by the late E. P. Wilbur for distribution in prizes as the faculty may determine. This fund yields an annual income of \$100.00.

THE JOHN B. CARSON PRIZE

An annual prize of \$50.00 was established in 1909 by Mrs. Helen B. Turner, of Philadelphia, Pa., in memory of her father, John B. Carson, whose son, James D. Carson, was a graduate of the Civil Engineering curriculum of Lehigh University in 1876. It is awarded for the best thesis by a senior pursuing the curriculum in Civil Engineering.

THE WILLIAM H. CHANDLER PRIZES IN CHEMISTRY

Four annual prizes of \$25.00 each, one in each class, for excellence in the curricula in Chemistry and Chemical Engineering, were established in 1920 by the gift of Mrs. Mary E. Chandler, of Bethlehem, Pa., widow of Dr. William H. Chandler, who was professor of Chemistry in Lehigh University from 1871 until his death in 1906. In memory of Dr. Chandler the faculty named the prizes the William H. Chandler Prizes in Chemistry.

THE ELECTRICAL ENGINEERING PRIZE

An annual prize of \$25.00, established by an anonymous graduate of the curriculum in Electrical Engineering, is awarded to the member of the graduating class presenting the best thesis in Electrical Engineering.

THE PHILIP FRANCIS DU PONT MEMORIAL THESIS PRIZE IN ELECTRICAL ENGINEERING

The Philip Francis du Pont Memorial Thesis Prize Fund was established in 1929 by L. S. Horner, E.E., '98. The annual income of this fund, \$150.00, is awarded each year as two prizes of \$100.00 and \$50.00 for the best senior theses in electrical engineering. The subject for 1932-1933 is: "Mercury Arc Rectifiers." If in any year, in the opinion of the head of the department of Electrical Engineering, no thesis submitted is worthy of the award, the income of the fund is accumulated and added to the succeeding year's award.

ALUMNI PRIZES

By a resolution of the Alumni Association of September 21, 1900, the Alumni Scholarship Fund, which was originally designed to help poor students, was, with the consent of the contributors, diverted from this purpose and the income devoted to prizes to members of the junior class. In 1932 two prizes of \$25.00 each were awarded to the first honor men of the curricula in Engineering Physics and Civil Engineering. In subsequent years the prizes will be awarded to the first honor men of the technical curricula in turn.

THE WILLIAMS PRIZES IN ENGLISH

Professor Edward H. Williams, jr., an alumnus of the University of the class of 1875, established in 1900 prizes for excellence in English composition and public speaking. The freshman, sophomore, and junior prizes are awarded by the faculty on the recommendation of the department of English.

FRESHMAN ORAL COMPOSITION PRIZES. A first prize of \$40.00 and a second prize of \$15.00 are awarded to freshmen of regular standing who excel in the oral composition contest held in May of each year.

SOPHOMORE COMPOSITION PRIZES. A first prize of \$50.00, a second prize of \$25.00, and a third prize of \$15.00, are awarded annually for the three best compositions submitted by sophomores of regular standing as required work in their English courses.

JUNIOR COMPOSITION PRIZES. A first prize of \$40.00 and a second prize of \$15.00 are awarded for the two best essays submitted by juniors as part of the required work of their courses in English.

SENIOR PRIZES. The senior prizes are awarded by the faculty on the recommendation of the committee on Williams Senior Prizes.

1. First prizes of \$75.00 and second prizes of \$25.00 are awarded annually in each of the four fields of Economics, English, Philosophy, and Psychology for dissertations submitted by regular members of the senior class on or before May 1st.

2. The committee on Williams Senior Prizes publishes before the close of the University year a list of recommended subjects for dissertations, but a senior may submit a dissertation upon any other subject in the respective fields if the subject has received the approval of the committee.

3. Each senior entering the competition shall submit to the committee his choice of subject and plan of work by December 1st.

4. The awards are made by the faculty upon recommendation of the committee, but no award is made if in any case a dissertation does not meet the standards of merit established by the committee. This standard includes such points as excellence in thought, plan, development, argument, and composition.

MISCELLANEOUS

HISTORY

Lehigh University was chartered by the Legislature of Pennsylvania by an act dated February 9, 1866. In 1865 the Hon. Asa Packer, of Mauch Chunk, inaugurated a movement to provide an institution that would afford training and education in the learned professions as then recognized, and in technical branches, the importance of which was then just becoming apparent in the development of the industrial and transportation interests of the country. He made an initial donation of a large tract of land for this purpose and the sum of \$500,000.00 to which he added largely during his lifetime and by his will.

Since its foundation the equipment and resources of the University have steadily increased through the continued interest of the University's trustees, alumni, and friends. The present endowment totals \$5,368,834.50. The first important addition to the University's original plant was the Sayre Observatory, donated in 1869 by Robert H. Sayre, of Bethlehem. Later donations include Packer Memorial Church, 1887; Williams Hall, 1902; Drown Memorial Hall, 1907; the Armory, 1907; the Wilbur Heating Plant and Engineering Laboratory, 1907; Taylor Hall, 1907; Sayre Park, 1909;

the Coxe Mining Laboratory, 1910; the Fritz Engineering Laboratory, 1910; Taylor Gymnasium and Taylor Field, 1913; the Alumni Memorial Building, 1924; the James Ward Packard Electrical and Mechanical Laboratory, 1926; the Library Extension, 1928.

GRADUATING THESES

Theses, when required, are accompanied by drawings and diagrams, whenever the subjects need such illustration. The originals are kept by the University, as a part of the student's record, for future reference, but copies may be retained by students, and may be published, permission having first been obtained from the faculty.

PLACEMENT SERVICE

A placement service is maintained with a director in charge. Through it the heads of the various curricula of the University cooperate with business and industry in placing men in suitable positions. This service covers alumni as well as seniors about to graduate. The placement office also serves as a central point of contact for undergraduates and employers interested in student part-time employment.

Teacher placement for those who desire to teach is aided by the Teacher Placement Committee. An important function of this committee is to work in cooperation with the Teacher Bureau of the Department of Public Instruction of Pennsylvania at Harrisburg.

STUDENTS' HEALTH SERVICE

The Students' Health Service, organized in 1923, has general charge of all health and sanitary measures in the University. The work of the department is organized under four heads: sanitation, physical examinations, dispensary service, education.

SANITATION. The director of the Health Service is in direct charge of the sanitation of University buildings and grounds, and exercises such supervision as is possible over other accommodations for students.

PHYSICAL EXAMINATIONS. Each student is required to undergo a complete physical examination each year. This ex-

amination, which is made jointly by the Health Service and the department of Physical Education, serves the needs of both these departments and also complies with the requirements of the Reserve Officers' Training Corps. All physical defects and departures from normal are noted, and the students are divided into groups as follows: (1) those who present no abnormalities and who can proceed with the regular mental and physical work of the University, (2) those who are abnormal or subnormal, but who should be brought up to normal by the regular courses in physical education, (3) those who require special or corrective treatment.

Students who fall into groups 2 and 3 are observed at regular intervals, and every effort is made to bring them up to the highest degree of physical development and health. Individual records are kept of the progress of each case.

DISPENSARY SERVICE. The Health Service maintains a dispensary in Saucon Hall where students may receive free treatment for minor illnesses and injuries. The dispensary hours are from 8.30 a.m. to 12.00 m. on all week days, from 1.30 to 5.00 p.m. on week days except Saturday, and from 10.00 a.m. to 12.00 m. on Sunday. A physician and a nurse are on duty in the dispensary during these hours. While the Health Service does not furnish medical attendance to students who are sick in their rooms, the director keeps in touch with such cases by telephone and otherwise in so far as is possible in order to see that the students are receiving proper attention and that the time lost from University work is minimized. It is requested that all such cases, together with the names of the attending physicians, be reported to the director in order that complete records of the health of the students may be kept.

EDUCATION. A course in Personal and Social Hygiene is given to freshmen by the director of the Health Service in conjunction with the departments of Biology and Physical Education. In this course emphasis is laid on those points of personal hygiene most applicable to the student recently deprived of the atmosphere and influences of home. In social hygiene an effort is made to disseminate correct information concerning the history and present status of social diseases and the effectiveness of approved methods for the

relief of existing conditions. This phase of the Health Service constitutes a specific part of the general program of instruction recommended by the State Board of Health and by other recognized organizations for the promotion of social hygiene.

HONORARY SCHOLARSHIP SOCIETIES

PHI BETA KAPPA. Students in the College of Arts and Science and the College of Business Administration who up to the middle of the senior year maintain high scholarship may be elected to membership; also a limited number of engineering students whose work in philosophical, scientific, and language studies is of high grade.

TAU BETA PI. This national honorary society, which now has forty-one chapters, was founded at Lehigh University in 1885, by Professor E. H. Williams, jr. Students in the College of Engineering who up to the middle of the junior year maintain high scholarship may be elected to membership.

SIGMA XI. Election to membership is based upon the completion of original and noteworthy research in pure or applied science and the publication of the results thereof. Ordinarily undergraduates are eligible to associate membership only, their election being based upon their promise of achievement in scientific research.

Other Scholastic Honorary Societies

ETA KAPPA NU (electrical engineering)

ETA SIGMA PHI (classics)

PHI ETA SIGMA (freshman)

PI MU EPSILON (mathematics)

PI TAU SIGMA (mechanical engineering)

ROBERT W. BLAKE SOCIETY (philosophy, psychology, and education)

COURSE SOCIETIES

Intellectual interest in various fields of study and professional spirit among pre-medical, pre-legal, business, and engineering students are promoted by a group of organizations commonly called course societies. The first of these organizations historically was the Chemical Society, established in 1871. The list now includes:

In Arts and Science

Delta Omicron Theta (public speaking)
Ernest W. Brown Astronomical Society
International Relations Club (history and government)
Newtonian Society (mathematics)
Pre-Legal Society
Robert W. Hall Pre-Medical Society

In Business Administration

Alpha Kappa Psi (professional fraternity in commerce)

In Engineering

Chemical Society
Student Chapter of the American Society of Civil Engineers
Electrical Engineering Society (student branch of the A. I. E. E.)
Industrial Engineering Society
Mechanical Engineering Society (student branch of the A. S. M. E.)
Metallurgical Society
Mining and Geological Society (student branch of the A. I. M. E.)
Physical Club
Radio Club

OTHER ORGANIZATIONS

Other student organizations include:
Arcadia (student self-government council)
Brown Key Society
Cyanide Club (junior honorary society)
Fencing Club
Interfraternity Council
L Club
Lehigh Band
Lehigh Union (general students' social organization)
Musical Clubs, Combined
Mustard and Cheese (dramatic club)
Omicron Delta Kappa (senior honorary fraternity)
Pi Delta Epsilon (honorary journalistic fraternity)
Rifle Club
Scabbard and Blade (honorary military fraternity)
Spiked Shoe (honorary fraternity, track athletics)
Sword and Crescent (senior honorary society)

The following Greek letter fraternities have chapters at Lehigh University: Alpha Chi Rho, Alpha Kappa Pi, Alpha Tau Omega, Beta Theta Pi, Chi Phi, Chi Psi, Delta Phi, Delta Sigma Phi, Delta Tau Delta, Delta Upsilon, Kappa Alpha, Kappa Sigma, Lambda Chi Alpha, Omega Phi Sigma (local), Phi Beta Delta, Phi Delta Theta, Phi Gamma Delta, Phi Sigma Delta, Phi Sigma Kappa, Pi Kappa Alpha, Pi Lambda Phi, Psi Upsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi, Sigma Phi Epsilon, Tau Delta Phi, Theta Delta Chi, Theta Kappa Phi, Theta Xi.

STUDENT PUBLICATIONS

The students of Lehigh University publish a semi-weekly college newspaper, *The Lehigh Brown and White*; a quarterly magazine, *The Lehigh Review*; a comic monthly, *The Lehigh Burr*; and a year-book, *The Epitome*.

FOUNDER'S DAY

The second Wednesday following the opening of the University in each year is celebrated as Founder's Day in honor of the Founder of the University, Asa Packer. Degrees are conferred and freshman and sophomore honors and prizes are announced.

At the exercises on October 5, 1932, the fifty-third Founder's Day, an address entitled "The Scientific Method" was delivered by William Francis Gray Swann, A.M., D.Sc., Director of the Bartol Research Foundation of the Franklin Institute.

UNIVERSITY SUNDAY

The Sunday preceding University Day is known as University Sunday, and is devoted to the baccalaureate service. The baccalaureate sermon on June 12, 1932, was preached by the Rev. Claude G. Beardslee, B.A., B.D., M.A., S.T.M., Ph.D., Chaplain of the University.

UNIVERSITY DAY

University Day marks the close of the academic year. On this day the graduation exercises are held, an address is given, senior honors and prizes are announced, and degrees are conferred. The address at the exercises on June 14, 1932,

was given by the Rev. Charles Reynolds Brown, S.T.D., D.D., L.H.D., LL.D., Emeritus Dean of the Divinity School, Yale University. Commissions in the Officers' Reserve Corps were awarded by Lieutenant Colonel Matthew Henry Thomlinson, Professor of Military Science and Tactics.

ALUMNI ASSOCIATION

The Alumni Association, which has been in existence since 1876, was incorporated in 1917 under the name the Alumni Association of the Lehigh University, Inc. The offices of the Association are in the Alumni Memorial Building. The Secretary, who is a permanent officer, edits the *Lehigh Alumni Bulletin*, a news publication issued monthly from October to July, inclusive, and the *Directory of Alumni and Students*. The Association is largely concerned with raising money to meet the needs of the University.

The officers and directors of the Alumni Association for 1932-1933 are:

President, Alexander Potter, '90, of New York, N. Y.
Vice-President, J. D. Berg, '05, of Pittsburgh, Pa.
Vice-President, J. A. Frick, '03, of Allentown, Pa.
Treasurer, R. S. Taylor, '95, of Bethlehem, Pa.
Secretary, A. E. Buchanan, jr., '18, of Bethlehem, Pa.
Archivist, R. P. More, '10, Bethlehem, Pa.

Honorary Alumni Trustees: Cadwallader Evans, jr., '01, of Scranton, Pa.; R. F. Dravo, '87, of Pittsburgh, Pa.; T. M. Girdler, '01, of Cleveland, O.; A. R. Glancy, '03, of Pontiac, Mich.; A. C. Dodson, '00, of Bethlehem, Pa., and E. F. Johnson, '07, of Detroit, Mich.

The following are the local alumni clubs: New York Lehigh Club, Philadelphia Lehigh Club, Pittsburgh Lehigh Club, Chicago Lehigh Club, Washington Lehigh Club, Detroit Lehigh Club, Cincinnati Lehigh Club, Toledo (Ohio) Lehigh Club, Northeastern Pennsylvania Lehigh Club (Scranton and Wilkes-Barre, Pa.), Maryland Lehigh Club (Baltimore, Md.), Lehigh Club of New England (Boston, Mass.), Lehigh Club of Central Pennsylvania (Harrisburg, Pa.), Lehigh Club of Northern New York (Schenectady, N. Y.), Lehigh Club of Northern Ohio (Cleveland, O.), Lehigh

Club of Southern New England (Hartford, Conn.), Lehigh Club of Western New York (Buffalo, N. Y.), Southern Anthracite Lehigh Club (Pottsville, Pa.), Lehigh Home Club (Bethlehem, Pa.), Lehigh Club of China (Wuchang, China), Lehigh Club of Cuba (Havana, Cuba), Lehigh Club of South-eastern Pennsylvania (Reading, Pa.), Lehigh Club of Trenton (N.J.), Lehigh Club of York (Pa.), Lehigh Club of Northern New Jersey (Newark), Lehigh Club of Northern California (San Francisco), Lehigh Club of Southern California (Los Angeles).

DEGREES

Conferred on University Day, June 14, 1932

HONORARY DEGREES

DOCTOR OF SCIENCE

Henry Alfred Gardner	Washington, D.C.
Edwin Fitch Northrup	Princeton, N.J.

DOCTOR OF HUMANE LETTERS

Samuel A. Tannenbaum	New York, N.Y.
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DOCTOR OF LAWS

Raymond Walters	Swarthmore
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DEGREES IN COURSE

MASTER OF ARTS

Major in English

Theodore George Ehrsam, B.A. (<i>Lehigh University</i>)	Tuckahoe, N.Y.
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Clyde Albert Harding, B.A. (<i>Lehigh University</i>)	Pen Argyl
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Major in History

Muriel Louise Wilson, A.B. (<i>Moravian College for Women</i>)	Bethlehem
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Major in Mathematics

Henry George Swain, A.B. (<i>Swarthmore College</i>)	East Orange, N.J.
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Major in Psychology

Clinton Draper Rankin, B.S. in Bus. Ad. (<i>Lehigh University</i>)	Bridgeport, Conn.
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MASTER OF SCIENCE

Major in Chemical Engineering

Albert Clef Baur, B.S. in Ch.E. New York, N.Y.
(Lehigh University)
 Edwin Thompson Clocker, B.S. in Ch.E. Bethlehem
(Lehigh University)
 Arthur Crossley Smith, Jr., B.S. in Ch.E. New York, N.Y.
(Bucknell University)

Major in Chemistry

Leonard Muhlenberg Bennetch, B.S.
 in Ch.E. Lebanon
(Lehigh University)
 Kenneth Groves Chesley, A.B. Minneola, Kans.
(University of Kansas)
 Kenneth Allen Earhart, B.S. in Ch.E. Avonmore
(Lehigh University)
 Alvin Jacob Frantz, B.S. in Chem. Allentown
(Lehigh University)
 Kenneth William Glace, B.S. in Ch.E. Bethlehem
(Lehigh University)
 Arthur William Goetz, Ch.E. Cincinnati, O.
(University of Cincinnati)
 William Schuyler Miller, B.S. in Chem. Allentown
(Lehigh University)
 Alfred Nathan Rogers, B.S. in Ch.E. Reading
(Lehigh University)
 Arthur Levern Smith, B.S. in Ch.E. Coatesville
(Lehigh University)

Major in Civil Engineering

John Gibbons, B.S. in C.E. Lynn, Mass.
(Tufts College)
 Carl Lester Kreidler, B.S. in C.E. Bethlehem
(Lehigh University)
 Donald Billman Stabler, B.S. in C.E. Williamsport
(Lehigh University)

Major in Electrical Engineering

William Albert Coyle, B.S. in E.E. Buffalo, N.Y.
(Clarkson College)
 Russel Otterbein Lerch, E.E. Palmyra
(Lehigh University)

Major in Geology

Bennett Frank Buie, B.S. Patrick, S.C.
(University of South Carolina)

Major in Mechanical Engineering

James Busse Hartman, B.S. in M.E. Allentown
(Lehigh University)

Robert Allan Stabler, B.S. in C.E. Williamsport
(Lehigh University)

George Boyd Thom, M.E. Upper Darby
(Lehigh University)

Major in Metallurgy

Francis James Moylan, B.S. in Met. Milton, Mass.
(Holy Cross College)

Forrest Jerome Whitney, Jr., B.S. in
 E.E. Philadelphia
(Lehigh University)

Major in Physics

J. Leland Myer, B.S. in Eng. Phys. Leola
(Lehigh University)

John Allen Osteen, B.S. Piedmont, S.C.
(Furman University)

BACHELOR OF ARTS

Wilton Altman	Ithaca, N.Y.
*Archibald MacGregor Anderson, Jr.	Brooklyn, N.Y.
Albert Joseph Belmore, Jr.	Schuyler, Va.
Ralph Criswell Benson	Brooklyn, N.Y.
Sydney Bernard Berkowitz	New York, N.Y.
Jackson Leroy Boughner	Duluth, Minn.
Daniel Augustus Brener	New York, N.Y.
Edgar Albert Collins	Scranton
William Middleton Collins	Saranac Lake, N.Y.
Douglas Treat Davidson, Jr.	Claymont, Del.
David G. Davis	New York, N.Y.
George Cooper Doering	Bryn Athyn
James Edwin Duncan	Washington
Norman Charles Ellison	South Orange, N.J.
Clinton Albert Feissner	Eckley
A. Bernard Friedman	Brooklyn, N.Y.
Abraham Goldberg	Bethlehem
Donald Wilson Haff	Northampton
Christian Leonard Hansen	Brooklyn, N.Y.
Edward P. Heether	Williamsport
Stephen Robert Holtzman	Hastings-on-Hudson, N.Y.
Alvord Hoyt	New Haven, Conn.
Rudolf ImHof	Reading
Morris Elliot Kaplan	Hartford, Conn.
Samuel Reginald Kaplus	Newark, N.J.
Henry Penn Krusen	Philadelphia
Sidney Louis Lancit	Newark, N.J.

* Diploma withheld pending completion of R.O.T.C. Camp.

Samuel Liever	Reading
J. Arthur Lipstein	Newark, N.J.
Nathan Griffith Macadam	Catasauqua
John Joseph Magyar	Bethlehem
Salvatore Charles Marino	New York, N.Y.
Lester Charles Martin	Elizabeth, N.J.
Sidney Charles Mele	Brooklyn, N.Y.
Jerold George Miller	Bethlehem
Philip Benham Myers	Kingston
Charles Francis Nassau, Jr.	Philadelphia
Harry Samuel Nickowitz	Newburgh, N.Y.
Daniel Cargill Osborn, Jr.	Honesdale
Maurice Binion Rosalsky	New York, N.Y.
Joel Elmer Rothenberg	Brooklyn, N.Y.
William Howard Sachs	Oil City
Sidney Hugh Saffer	Brooklyn, N.Y.
Robert Salwen	Brooklyn, N.Y.
Donald Stanley Sawyer	Bethlehem
Meyer William Shanker	Brooklyn, N.Y.
A. Wilson Sobel	New York, N.Y.
Cecil E. Sobo	Newark, N.J.
Samuel Solomon	Brooklyn, N.Y.
William Henry Spath	Hoboken, N.J.
Matthew Thominson	Berkeley, Cal.
Robert Lincoln Tiff	Brooklyn, N.Y.
Herman Martin Tilles	Jamaica, N.Y.
Andrew Edison Tonkonogy	Brooklyn, N.Y.
Joseph Walter Towle	Potosi, Mo.
Gerald Wood Ullman	Reading
William Chamberlain Warner	Montrose
Harold Jeffrey Weinstock	Brooklyn, N.Y.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

Hamilton Fairfax Allen	San Antonio, Tex.
Simon Askin	Mount Vernon, N.Y.
Samuel Bailey	Glendale, O.
*George Nicholas Beckwith	Pittsburgh
Melville Comstock Bingham	Rome, N.Y.
Samuel Blum	Allentown
Lewis Fred Bomhoff, Jr.	Jackson, Mich.
Julian Harvey Booker	Wilmington, Del.
Louis LeGrand Brennesholtz	East Orange, N.J.
John Gilmore Brewer	Pittsburgh
Robert Calvin Dakin	Scranton
Charles Edwin Dorworth, Jr.	Bellefonte
Donald James Drake	Buffalo, N.Y.
Thaddeus William Drobek	Reading
Warren Valleau Duke	Ridgewood, N.J.

* Diploma withheld pending completion of R.O.T.C. Camp.

Robert Maxwell Earl	Harrisburg
George Willis Ely	Holmdel, N.J.
Robert Haydock Ensocoe	Port Washington, N.Y.
Herbert August Gaetjens	Oradell, N.J.
Daniel Henry Geary	Springfield, Mass.
Carl Richard Giegerich	Flushing, N.Y.
William Henry Goehring, Jr.	New Brighton
Samuel Ben Goodman	Bethlehem
Merle James Graham	Pittsburgh
George Alexander Harris	Scranton
Joseph Hemig Heffner	Wyomissing Hills
William Emanuel Herman	York
Benjamin Franklyn Hires	Roadstown, N.J.
Carl Firman Hull	East Orange, N.J.
Albert Humphrey Jacobs, Jr.	Philadelphia
William Scott James	East Orange, N.J.
Gordon Osborn Jones	Irvington, N.J.
Leon Kaplan	Scranton
Walter Schmidt Kostenbader	Nazareth
Henry August Kriebel	Allentown
James Stuart Little	Pelham Manor, N.Y.
Hayden James Lockhart	Parkersburg, W.Va.
William Alexander Lownie	Buffalo, N.Y.
John Martin Lyons, Jr.	Princeton, N.J.
Willis Clayton MacDougall	East Orange, N.J.
James Earl Maharay	Newburg, N.Y.
Charles Edwin Marks, Jr.	Yonkers, N.Y.
William McCandless Mayberry	Philadelphia
John Gates McMullen	Maplewood, N.J.
Alfred Mason McNeill	Philadelphia
Lawson Hawkins Miller	Newburgh, N.Y.
Winton Lucius Miller, Jr.	Washington, D.C.
Maurice Franklin Mor	Irvington, N.J.
Irving David Moscowitz	New York, N.Y.
Franklin Carpenter Murphey	Athens, O.
Melvin Bernard Oberstein	Allentown
Samuel Jacob Platsky	Wilkes-Barre
John Seymour Roeder	Richmond Hill, N.Y.
William Oscar Roth	New Rochelle, N.Y.
Burton Webster Saxtan	Jersey City, N.J.
Edward Laurence Schacht	Flushing, N.Y.
Murray Courtright Schilling	Clark's Summit
Edmund Thaddeus Sergott	Glen Lyon
Arthur Sofman	Newark, N.J.
Alfred Thomas Stanley	New York, N.Y.
Ross Fultz Sweeny	Nutley, N.J.
Barkley Wyckoff, Jr.	Glen Ridge, N.J.

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

John David Brandner
 Jesse Bayliss Bronstein, Jr.

Bethlehem
 Allentown

Frank John French	New Rochelle, N.Y.
Charles Everard Green	Duluth, Minn.
William Kenneth Griesinger	Plainfield, N.J.
George Austin Hottle	Bethlehem
Robert Duggan Jones	Kingston
Emerson Wertz Kaufmann	Wyomissing
Robert Krone	Hackensack, N.J.
Kenneth LeRoy Kuklentz	Bethlehem
Harry Lawrence McLean	Scranton
Joseph Napravnik	Freemansburg
Henry Thomas Newhard	Fullerton
Harry Brooks Osborn, Jr.	Newark, N.J.
Benjamin Rabinowitz	Scranton
James Burness Rather, Jr.	Brooklyn, N.Y.
Edwin Morrison Ross	Philadelphia
Samuel Hunt Shipley	York
Alonzo Loraine Sinclair	Norristown
Charles Byron Slichter	Reading
Francis Gerecke Smith	Newburgh, N.Y.
Clarence Don Warnick	Washington, D.C.
William H. A. Weber, Jr.	Maplewood, N.J.
Benton Diehl Wittemeyer	Bethlehem
Randolph Daniel Zonge	Williamsport

BACHELOR OF SCIENCE IN CHEMISTRY

Ferdinand LaRue Friedrich	Hawthorne, N.J.
William Charles Fritz	Bethlehem
George MacKenzie Templeman	Bridgeport, Conn.
Harvey Aurand Whitenight	Allentown

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Leonard Brooks	Philadelphia
Roger Illick Fluck	Bethlehem
Frank Willis Gadd	Hartford, Conn.
Charles Reginald Kates	Cape May Court House, N.J.
Theodore Robert Kellner	Llanerch
William Donald Miller	Scranton
Francis A. Murray	New Haven, Conn.
Charles Howard Robson	Lansdowne
William Mitchell Schuck	Philadelphia
John Francis Schwartz	Allentown
Charles Courtney Seabrook	Bridgeton, N.J.
Franklin Bolton Shaw	Swedesboro, N.J.
John Thomas	Pottsville
James Sansbury Throckmorton, III	Caldwell, N.J.

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Carl Washington Banks	Pottsville
John Douglas Brown	Reading
Joseph John Grinevich	Mahanoy City

*Robert Harris Harris	Narberth
Levin Baker Huntington, Jr.	New Rochelle, N.Y.
George Martin Kaleda	Mahanoy City
Ray Gernert Shankweiler	Allentown
Stephen Solotwa	Bethlehem
Edgar Samuel Stem, Jr.	Alderson
Lloyd Fletcher Underwood	Chatham, N.J.

BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

Paul Aaron Behney	Freeland
William Ogle Bennett, Jr.	Lancaster
Edward Braislin Douglas	Plainfield, N.J.
William Cronk Elmore	Moutour Falls, N.Y.
David Lewis MacAdam	Upper Darby
John Wesley Schneider	Lancaster
Stewart Applegate Shimer, Jr.	Bethlehem
William Lloyd Sones	Pottsville
Albert Monforte Thorne, Jr.	Richmond Hill, N.Y.
Milton Gabriel Young	Coopersburg
Paul Oscar Young	Kingston
Richard Howard Zinszer, B.A.	Hays, Kans.

(Fort Hays Kansas State College)

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

William Leighley Arthur	Pittsburgh
Armand Raphael Baldwin	Lansford
Howard Frederick Casselman	South Orange, N.J.
Robert Curtis Clark	Pittsburgh
William Myers Eyster	York
Matthew Gilbert Fairchild	Monterrey, Mexico
George Thomas French, Jr.	Bloomfield, N.J.
Henry Heyward Fryling	Short Hills, N.J.
Joseph Bert Homsher	Strasburg
John Frederick Leach	Reading
David Perry Nichols	Pennington, N.J.
Arthur George Rohrs	Ridgewood, N.J.
Raymond Koch Serfass	Pottsville
Rowland James Simes, Jr.	East Moriches, N.Y.
Louis Jackson Stow	Merchantville, N.J.
John Louis Williamson	Miami, Florida
Stanmore VanNess Wilson	East Orange, N.J.

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Vincent Paul Berger	Aberdeen Proving Ground, Md.
Lawson Valentine Britton	Scranton
Libert Theodore Chandler	Bethlehem

* Diploma withheld pending completion of R.O.T.C. Camp.

Manuel Deutschman	Easton
Henry Burns Elliott	Lansdowne
Hörl Jay Freiday	East Orange, N.J.
William John Gamble, Jr.	Allentown
Kirtland Cutter Gardner, Jr., B.A. <i>(Williams College)</i>	Coraopolis
Edward Martin Gormley	Hazleton
Edward Barkdoll Hildum	Plainfield, N.J.
Arthur Welch Horne	Plainfield, N.J.
Peter Graham Reynolds	Bethlehem
Kenneth Keiser Rinker	Catasauqua
Carl Frederick Schier, Jr.	Baltimore, Md.
Stanley Emanuel Simon	Seaford, Del.
Ira Townsend Stoneback	East Orange, N.J.
Robert Howard Swoyer	Hazleton

**BACHELOR OF SCIENCE IN METALLURGICAL
ENGINEERING**

John Elmer Angle, Jr.	Mansfield, O.
Alfred Frank Barnard, Jr.	North Arlington, N.J.
Donald Payne Beaver	Bethlehem
Daniel Elwert Best	Stanhope, N.J.
Edward St. Clair Buckler, Jr.	Baltimore, Md.
Henry James Forsyth	Buffalo, N.Y.
William John Jackel	McKeesport
Francis James Kearns	Bridgeport, Conn.
Arnold Wilhelm Nelson	Westerleigh, N.Y.
Albert Lewis Neudoerffer	Phoenixville
William Carl Simpson	Columbia, N.J.

BACHELOR OF SCIENCE IN MINING ENGINEERING

John George Bienfang	Linden, N.J.
Thomas Stevens Cleaver	Reading
Watson Edward Current	Newark, N.J.
John James Holahan	Reading
Carl Andrew Miller	Rosebank, N.J.
Francis Maylum Morris	Lansdale
Filadelfio Narzisi	Bath
John Edwin Oldham	Greenwich, Conn.
Robert Holland Raring	Harrisburg

**COMMISSIONS AS SECOND LIEUTENANT IN THE
OFFICERS' RESERVE CORPS**

MEMBERS OF THE GRADUATING CLASS

Infantry

Armand Raphael Baldwin	Lansford
Sydney Bernard Berkowitz	New York, N.Y.
George Cooper Doering	Bryn Athyn

Edward Braislin Douglas	Plainfield, N.J.
Thaddeus William Drobek	Reading
Carl Richard Giegerich	Flushing, N.Y.
William Henry Goehring, Jr.	New Brighton
Edward Martin Gormley	Hazleton
John James Holahan	Reading
John Gates McMullen	Maplewood, N.J.
William Howard Sachs	Oil City
Carl Frederick Schier, Jr.	Baltimore, Md.
William Mitchell Schuck	Philadelphia
John Francis Schwartz	Allentown
Alfred Thomas Stanley	New York, N.Y.
Clarence Don Warnick	Washington, D.C.
John Louis Williamson	Miami, Fla.

Ordnance

Alfred Frank Barnard	North Arlington, N.J.
George Austin Hottle	Bethlehem
David Lewis MacAdam	Upper Darby
Benjamin Rabinowitz	Scranton
Robert Holland Raring	Harrisburg
Raymond Koch Serfass	Pottsville

UNDERGRADUATES

Infantry

Robert Ruch Bachman	Drexel Hill
Russell Williams Burk	Newark, N.J.
George Hempstead Riley	Hagerstown, Md.
Albert Pauldin Thomas	Flushing, N.Y.
Carl Augustus Weaver	Oradell, N.J.

Ordnance

Allan Ayers, Jr.	Elizabeth, N.J.
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**CERTIFICATES OF ELIGIBILITY FOR COMMISSIONS AS
SECOND LIEUTENANT IN THE OFFICERS'
RESERVE CORPS**

(Commissions withheld because of the candidates
being under age)

MEMBERS OF THE GRADUATING CLASS

Infantry

John Frederick Leach	Reading
Arthur George Rohrs	Ridgewood, N.J.

Ordnance

Emerson Wertz Kaufmann	Wyomissing
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UNDERGRADUATE

Thomas William Frutiger Red Lion

Conferred on Founder's Day, October 5, 1932

HONORARY DEGREE

DOCTOR OF ENGINEERING

Charles Austin Buck Bethlehem

DEGREES IN COURSE

MASTER OF ARTS

Major in Education

Roy Samuel McKeever, B.A. Egypt
(*Western Reserve University*)

Major in English

Philip Gesoff, Ph.B. Allentown
(*Muhlenberg College*)William Jacob Steidle, B.A. Jamesburg, N.J.
(*Lehigh University*)

MASTER OF SCIENCE

Major in Chemistry

Walter John Brand, A.B. Gunnison, Col.
(*Western State College*)

Major in Civil Engineering

Justus Mitchell Holme, B.S. in C.E. Philadelphia
(*University of Pennsylvania*)Hill Reid Nettles, C.E. Dillon, S.C.
(*University of South Carolina*)

Major in Electrical Engineering

Carleton Francis Maylott, B.S. in E.E. Derby, Conn.
(*Worcester Polytechnic Institute*)

BACHELOR OF ARTS

Kenneth Woodrow Barthold	Bethlehem
Frank Lynn Fisher, Jr.	Pottsville
James Francis Fitzpatrick, Jr.	Bayside, N.Y.
Henry Laessle Klippert	Mountain Home
Paul Joseph Kopp	Allentown
Hayden Eugene Norwood	Bethlehem
Robert Wilgus Phillips	Bayonne, N.J.
Sidney Robert Rosenwasser	New York, N.Y.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

Allen Hyer Halbert	Kew Gardens, N.Y.
Willis Frederick Linn	Tremont
George Hempstead Riley	Hagerstown, Md.
Allen Theodore Ware	Glassboro, N.J.
Robert James Wilson, II	Merion

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

Manfred Jacques Haas	New York, N.Y.
Donald Henry May	Hazleton
Charles William Pimper, Jr.	Chevy Chase, Md.
James Van Atta Wert	Hackettstown, N.J.

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Samuel Robert Crocco	Weedville
Charles Faust Walborn	Wilkes-Barre

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Curtis Alden Chase	Danbury, Conn.
Arno Lee Roy Duncan	Reading

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Walter Welling Lawrence	Brooklyn, N.Y.
Melvin LeRoy Long	Muncy

**BACHELOR OF SCIENCE IN METALLURGICAL
ENGINEERING**

John Edward Kehoe	Bethlehem
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HONORS AND PRIZES*Announced on University Day, June 14, 1932***Graduation Honors****GRADUATED WITH HIGHEST HONORS**

William Cronk Elmore	Phys. Montour Falls, N.Y.
David Lewis MacAdam	Phys. Upper Darby
William Kenneth Griesinger	Ch.E. Plainfield, N.J.
Benjamin Rabinowitz	Ch.E. Scranton

GRADUATED WITH HIGH HONORS

Wilton Altman	Arts Ithaca, N.Y.
Daniel Augustus Brener	Arts New York, N.Y.

GRADUATED WITH HONORS

William Ogle Bennett, Jr.	Phys. Lancaster
Jackson Leroy Boughner	Arts Duluth, Minn.
Edward St. Clair Buckler, Jr.	Met.E. Baltimore, Md.

George Cooper Doering	Arts	Bryn Athyn
Douglas Treat Davidson, Jr.	Arts	Claymont, Del.
Robert Maxwell Earl	Bus.	Harrisburg
George Willis Ely	Bus.	Holmdel, N.J.
Roger Illick Fluck	C.E.	Bethlehem
Henry Heyward Fryling	I.E.	Short Hills, N.J.
Joseph John Grinevich	E.E.	Mahanoy City
Donald Wilson Haff	Arts	Northampton
George Austin Hottle	Ch.E.	Bethlehem
Rudolf Emanuel ImHof	Arts	Reading
Theodore Robert Kellner	C.E.	Llanerch
Henry Penn Krusen	Arts	Philadelphia
Sidney Louis Lancit	Arts	Newark, N.J.
Nathan Griffith Macadam	Arts	Catasauqua
James Earl Maharay	Bus.	Newburgh, N.Y.
Lester Charles Martin	Arts	Elizabeth, N.J.
Francis Maylum Morris	E.M.	Lansdale
Philip Benham Myers	Arts	Kingston
Filadelfio Narzisi	E.M.	Bath
Daniel Cargill Osborn, Jr.	Arts	Honesdale
Robert Holland Raring	E.M.	Harrisburg
Peter Graham Reynolds	M.E.	Bethlehem
Kenneth Keiser Rinker	M.E.	Catasauqua
Arthur George Rohrs	I.E.	Ridgewood, N.J.
Maurice Binion Rosalsky	Arts	New York, N.Y.
Robert Salwen	Arts	Brooklyn, N.Y.
Donald Stanley Sawyer	Arts	Bethlehem
John Wesley Schneider	Phys.	Lancaster
Charles Courtney Seabrook	C.E.	Bridgeton, N.J.
Raymond Koch Serfass	I.E.	Pottsville
Charles Byron Slichter	Ch.E.	Reading
William Henry Spath	Arts	Hoboken, N.J.
Robert Howard Swoyer	M.E.	Hazleton
Matthew Thomlinson	Arts	Berkeley, Cal.
Albert Monforte Thorne, Jr.	Phys.	Richmond Hill, N.Y.
Lloyd Fletcher Underwood	E.E.	Chatham, N.J.
William Chamberlain Warner	Arts	Montrose
Milton Gabriel Young	Phys.	Coopersburg
Randolph Daniel Zonge	Ch.E.	Williamsport

GRADUATED WITH SPECIAL HONORS

Chemistry

Benjamin Rabinowitz Scranton

Economics

Daniel August Brener New York, N.Y.
Abraham Wilson Sobel Jersey City, N.J.

English

William Chamberlain Warner Montrose

	Greek	
Daniel Cargill Osborn, Jr.		Honesdale
	History	
Henry Penn Krusen		Yeadon
	Physics	
David Lewis MacAdam		Upper Darby
Albert Monforte Thorne, Jr.		Richmond Hills, N.Y.

HONOR GRADUATES IN THE RESERVE OFFICERS' TRAINING CORPS		
William Mitchell Schuck		Philadelphia
John Louis Williamson		Miami, Fla.

Prizes

WILLIAM SENIOR PRIZES IN ENGLISH

First and Second Prizes, \$75.00 and \$25.00 combined and equally divided between

Hayden Eugene Norwood	Bethlehem
William Chamberlain Warner	Montrose

WILLIAMS SENIOR PRIZES IN ECONOMICS

Second Prize, \$25.00

Daniel Augustus Brener	New York, N.Y.
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WILLIAM H. CHANDLER PRIZE, \$25.00, to the highest ranking senior in the curricula in Chemistry and Chemical Engineering

William Kenneth Griesinger	Plainfield, N.J.
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PHILIP FRANCIS DUPONT MEMORIAL THESIS PRIZES IN ELECTRICAL ENGINEERING

First Prize, \$100.00

George Martin Kaleda	Mahanoy City
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Second Prize, \$50.00

Carl Washington Banks	Pottsville
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AHEPA PRIZE, for the best work in Greek literature, \$15.00

Daniel Cargill Osborn, Jr.	Honesdale
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ELECTRICAL ENGINEERING PRIZE, \$25.00, for the best E.E. thesis

Levin Baker Huntington, Jr.	Baltimore, Md.
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Edgar Samuel Stem, Jr.	Alderson
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METALLURGICAL ENGINEERING SENIOR PRIZE, \$50.00

John Elmer Angle, Jr.	Mansfield, O.
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AMERICAN SOCIETY OF CIVIL ENGINEERS JUNIOR MEMBERSHIP PRIZE

Charles Courtney Seabrook	Bridgeton, N.J.
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Announced on Founder's Day, October 5, 1932**Graduation Honors****GRADUATED WITH SPECIAL HONORS****English**

Hayden Eugene Norwood Bethlehem

Freshman and Sophomore Honors, 1931-1932

(Awarded to those members of the classes of 1934 and 1935 who made an average grade of B or higher during the scholastic year 1931-1932.)

FRESHMAN HONORS

Alfred Wilbur Acker	Eng.	Cleveland, O.
William Bamert	Bus.	South Orange, N.J.
Kenneth Orion Beatty, Jr.	Eng.	Drexel Hill
Francis Wood Blanchard	Eng.	Pennington, N.J.
Charles Cox Brandt, Jr.	Eng.	Newport
Paul Budura	Arts	Bethlehem
Arthur Stanley Cohen	Arts	Hagerstown, Md.
Carl Edward Collander	Eng.	Newark, N.J.
Walter Lorraine Deemer, Jr.	Arts	Quakertown
John Bauer Diefenbach	Eng.	Westfield, N.J.
Samuel Efron	Arts	Allentown
Lawrence Joseph Ertle	Eng.	Pittsburgh
Harvey James Everett	Eng.	Allentown
Willard Fruehan	Eng.	Scranton
William Smith Gallaway	Eng.	Rutherford, N.J.
Henry Peter George	Eng.	Palmeron
Stanley Raymond Goodrich	Bus.	Belleville, N.J.
Charles Adam Heiberger	Eng.	Allentown
Eugene Howe Henry	Bus.	Ridgewood, N.J.
Frank Joseph Hollister	Eng.	Sea Cliff, N.Y.
Winslow Leroy Hurford	Eng.	Neptune, N.J.
William Austin Johnson	Eng.	Washington, D.C.
Mike Koman	Eng.	Fogelsville
William Charles Levenson	Arts	Newark, N.J.
Richard Ridge McClintic	Eng.	Pittsburgh
Edgar Gilpin Miller	Arts	Easton
Robert Frantz Miller	Eng.	Lancaster
Malcolm Stabler Muir	Arts	Williamsport
Shelton Arthur Musser	Eng.	Reading
Charles Herman Neiman	Eng.	York
Samuel Brandt Nissley	Eng.	Salunga
Paul Franklin Preston	Eng.	Bethlehem
Forest Clarence James Purnell	Eng.	Pottstown
Charles Jacob Rife	Eng.	Lemoyne
Reginald LaDow Riley	Bus.	Port Norris, N.J.
Ferman Thomas Ritter	Eng.	Easton

Edwin Albert Sawyer	Bus.	Bethlehem
Bernard Schwartz	Arts	Allentown
Howard Wilson Seeley, Jr.	Eng.	Woodcliff, N.J.
Bradford Kimball Smith	Arts	Maplewood, N.J.
Louis Price Struble, Jr.	Eng.	Westfield, N.J.
LeRoy Otten Travis	Eng.	Great Neck, N.Y.
Rohn Truell	Eng.	Easton
William Seligman Weil, Jr.	Eng.	Philadelphia
Herbert George Wyman	Bus.	Glen Ridge, N.J.

SOPHOMORE HONORS

William Bailey Agocs	E.M.	Freemansburg
Gellert Spencer Alleman	Arts	Wallingford
Bernard Isadore Basch	Arts	Scranton
Benjamin DeWitt Beach	E.E.	Montrose
William Harvey Bohning	Arts	Bethlehem
David Claude Bomberger	E.E.	Reading
Herbert Theodore Brunn	Bus.	Brooklyn, N.Y.
Richard McCulloch Byers	E.E.	Catonsville, Md.
Charles Reed Chambers	Bus.	Audubon, N.J.
Diar Ellsworth Clark	E.E.	Deposit, N.Y.
William Franklin Cook	M.E.	Sylvan
Nelson Yeomans Coxe	M.E.	Uniontown
David Eckstein	Arts	Trenton, N.J.
Harry Mueller Fisher	Ch.E.	Drexel Hill
Leonard Hawkins Fisher	Arts	Oakville, Conn.
James Osborn Fuller	Arts	Bethlehem
Harry Crickard Haupt, Jr.	Ch.E.	York
Charles Clement Hertel, Jr.	M.E.	Ridgewood, N.J.
Leonard Coe Hirsch	Bus.	White Plains, N.Y.
Kenneth Louis Honeyman	E.E.	Somerville, N.J.
Thomas Liggett, III	Ch.E.	Jenkintown
Richard Nicholas Lindabury	Chem.	Burlington, N.J.
Charles Grant MacDonald	Ch.E.	Norwalk, Conn.
Victor Mayer	Arts	Brooklyn, N.Y.
Charles Allen McCarty	C.E.	Bethlehem
Milton Meissner	Ch.E.	Plainfield, N.J.
Clinton Fred Miller	Ch.E.	Berwick
Therman Clifford Noecker	E.E.	Shoemakersville
James Joseph Procopio	Arts	Shamokin
Robert Leinbach Riley	I.E.	Woodcliff, N.J.
Harold Silverstein	Arts	Philadelphia
Eugene Lee Wildman, Jr.	M.E.	Baltimore, Md.
Wilbur Carl Winblad	Bus.	Brooklyn, N.Y.
David Graham Wright	Arts	Philadelphia

Prizes

WILBUR PRIZES, FRESHMAN YEAR

Mathematics, First Prize, \$15.00
 William Austin Johnson

Washington, D.C.

Mathematics, Second Prize, \$10.00	
Henry Peter George	Palmerton
English, \$15.00	
Walter Lorraine Deemer, Jr.	Quakertown
German, \$15.00, divided between	
David Isadore Abse	Bethlehem
Paul Budura	Bethlehem
French, \$15.00	
William Bamert	South Orange, N.J.

WILBUR PRIZES, SOPHOMORE YEAR

Mathematics, \$10.00	
David Claude Bomberger	Reading
English, \$10.00	
Gellert Spencer Alleman	Wallingford

WILLIAMS FRESHMAN PRIZES IN ORAL COMPOSITION

First Prize, \$40.00	
Ernest Joseph Heether	Williamsport
Second Prize, \$15.00	
Julio Zumeta	Havana, Cuba

WILLIAMS JUNIOR PRIZES IN ENGLISH COMPOSITION

First Prize, \$40.00	
Arthur Leonard Benson	Easton, Md.
Second Prize, \$15.00	
Abraham Edward Grudin	Hillside, N.J.

MATHEMATICS PROBLEM PRIZES

Lloyd David Anderson	Red Lion
Melvin Dresher	Hackensack, N.J.
John Williamson Langhaar	Allentown
Robert Julius Myers	Elkins Park

WILLIAM H. CHANDLER PRIZES IN CHEMISTRY

Freshman Year, \$25.00	
Henry Peter George	Palmerton
Sophomore Year, \$25.00	
Milton Meissner	Plainfield, N.J.
Junior Year, \$25.00	
Robert Scott Taylor	Pottsville

METALLURGICAL ENGINEERING PRIZE, SOPHOMORE YEAR, \$50.00

 Edwin Herman Engel Plainfield, N.J.

ALUMNI JUNIOR PRIZES

Engineering Physics, \$25.00	
Robert Julius Myer	Elkins Park

Civil Engineering, \$25.00

Morris Bordner Uhrich Myerstown

WILBUR SCHOLARSHIP, \$200.00, to the sophomore with the best record

David Graham Wright Philadelphia

TAU BETA PI PRIZE (slide rule), to the highest technical freshman

William Austin Johnson Washington, D.C.

ETA SIGMA PHI MEDAL, for the best work in sophomore collegiate Latin

William Harvey Bohning Bethlehem

ALPHA KAPPA PSI MEDALLION, to the highest ranking junior in Business Administration

Charles Albert Bennett White Plains, N.Y.

Pi TAU SIGMA PRIZE, for the best record among freshmen enrolling in Mechanical Engineering

Robert Frantz Miller Lancaster

ETA KAPPA NU PRIZE (handbook), to the highest ranking freshman enrolling in Electrical Engineering

William Seligman Weil, Jr. Philadelphia

PHI ETA SIGMA SCHOLARSHIP CUP, awarded to the living group whose freshmen (not fewer than five) have made the highest scholarship average for the preceding year

Chi Phi

PHI SIGMA KAPPA SCHOLARSHIP CUP, awarded for one year to the fraternity in the Interfraternity Council having the highest scholarship average for the preceding year

Lambda Chi Alpha

TRUSTEES' SCHOLARSHIP CUP, awarded for one year to the living group having the highest scholarship average for the preceding year

Leonard Hall

STUDENTS, 1932-1933

GRADUATE STUDENTS

Name	Candidate for	Residence
Ackerman, Cleon Cleveland, B.S. (<i>Moravian College</i>)	M.S. Lancaster	
Albright, Louise, A.B. (<i>Cedar Crest College</i>)	(Major: Chemistry)	
Allen, Edna May, Ph.B. (<i>Muhlenberg College</i>)	M.A. Allentown	
Anderson, Judith, Ph.B. (<i>Muhlenberg College</i>)	(Major: History)	
Barnitz, Edward Switzer, Ch.E. (<i>Lehigh University</i>)	M.A. Allentown	
Beall, Alton Richard, B.A. (<i>University of Cincinnati</i>)	(Major: English)	
Beary, Joyce Elizabeth, B.A. (<i>Moravian College for Women</i>)	M.A. Bethlehem	
Belzner, Edna, Ph.B. (<i>Muhlenberg College</i>)	(Major: History)	
Beverley, William, B.S. (<i>University of Florida</i>)	M.A. Bethlehem	
Bittrich, Carl Louis, Met.E. (<i>Lehigh University</i>)	(Major: Chemical Eng.)	
Bleam, Althea Gertrude, A.B. (<i>Cedar Crest College</i>)	M.S. Williamsport, O.	
Bock, Louis, B.S. (<i>Moravian College</i>)	(Major: Chemistry)	
Brandner, John David, B.S. in Ch.E. (<i>Lehigh University</i>)	M.A. Allentown	
Bronstein, John Paul, B.A., B.L. (<i>Washington and Lee University</i>)	(Major: Education)	
Brown, Theodore Aulenbach, B.A. (<i>Moravian College</i>)	M.A. Bethlehem	
Burger, James Wendell, A.B. (<i>Haverford College</i>)	(Major: Mathematics)	
Carpenter, Marjorie Elizabeth, A.B. (<i>Cedar Crest College</i>)	M.S. Allentown	
Ciastkewicz, Arthur Joseph, B.S. in E.M. (<i>Lehigh University</i>)	(Major: Metallurgy)	
Coleman, Walter Barton, A.B. (<i>Swarthmore College</i>)	M.A. Bethlehem	
Colver, William Henry, Jr., B.S. in Bus. (<i>Lehigh University</i>)	(Major: English)	
Connelly, John Robert, B.S. in M.E., M.S. (<i>University of Illinois</i>)	M.A. Lebanon	
Conover, Lawrence John, B.S. in E.E., E.E. (<i>Lafayette College</i>)	(Major: Biology)	
	M.A. Allentown	
	(Major: Spanish)	
	M.S. Hackettstown, N.J.	
	(Major: Education)	
	M.A. New York, N.Y.	
	(Major: Mathematics)	
	Speeceville	
	Bethlehem	
	(Major: Education)	
	M.S. Easton	
	(Major: Electrical Eng.)	

Cooper, George Ellsworth, B.S. in Ch.E.	M.S.	Coopersburg
(<i>Lehigh University</i>)		(Major: Chemistry)
Crary, Albert Paddock, B.S.	M.S.	Canton, N.Y.
(<i>St. Lawrence University</i>)		(Major: Physics)
Crum, Richard Henry, A.B., A.M.		Jamaica, N.Y.
(<i>Columbia University</i>)		(Major: Latin)
Cyphers, Elmer Benjamin, B.S. in Ch.E.	M.S.	Bethlehem
(<i>Lehigh University</i>)		(Major: Chemistry)
Danello, Anthony Oregondine John,		
B.S. in E.E.	M.S.	Jersey Shore
(<i>Ohio University</i>)		(Major: Electrical Eng.)
Day, Lester Eugene, B.S. in Chem.	M.S.	Lyons, N.J.
(<i>Johns Hopkins University</i>)		(Major: Chemical Eng.)
Deily, Robert Howard, A.B., B.S. in L.S.	M.A.	Bethlehem
(<i>Muhlenberg College, Columbia University</i>)		
		(Major: English)
DeMoyer, Robert, C.E.	M.S.	Camden, N.J.
(<i>Lehigh University</i>)		(Major: Civil Eng.)
Dodson, Adams, B.A., LL.B.	M.A.	Bethlehem
(<i>Yale University, Harvard University</i>)		
		(Major: History)
Douglas, Edward Braislin, B.S. in		
Eng. Phys.	M.S.	Plainfield, N.J.
(<i>Lehigh University</i>)		(Major: Physics)
Doushkess, Victor Hugo, B.S., M.A.		Easton
(<i>Lehigh University, Lafayette College</i>)		
		(Major: Mathematics)
Easton, Elmer Charles, B.S. in E.E.	M.S.	Newark, N.J.
(<i>Lehigh University</i>)		(Major: Electrical Eng.)
Farrell, Samuel Wroath, B.S. in Ch.E.	M.S.	Cleveland, O.
(<i>Case School of Applied Science</i>)		(Major: Chemistry)
Fink, Lawson Jeremiah, A.B.	M.A.	Albany
(<i>Muhlenberg College</i>)		(Major: Education)
Formhals, William Harry, B.S. in E.E.	M.S.	Pittsburgh
(<i>University of Illinois</i>)		(Major: Electrical Eng.)
Fox, Bertha Sprague, B.A.	M.A.	Bethlehem
(<i>Moravian College for Women</i>)		(Major: History)
Freehafer, John Edwin, B.S. in Eng.		
Phys.	M.S.	Reading
(<i>Lehigh University</i>)		(Major: Mathematics)
Fritz, William Charles, B.S. in Chem.	M.S.	Bethlehem
(<i>Lehigh University</i>)		(Major: Chemistry)
Frye, John H., Jr., B.A., M.S.	M.S.	Birmingham, Ala.
(<i>Howard College</i>)		(Major: Metallurgy)
Fuller, Merton Otis, C.E.	M.S.	Bethlehem
(<i>Syracuse University</i>)		(Major: Civil Eng.)
Genszler, William G., Ph.B.	M.A.	Allentown
(<i>Muhlenberg College</i>)		(Major: History)
Godfrey, Howard Johnson, B.S. in C.E.	M.S.	Needham
(<i>Tufts College</i>)		Heights, Mass.
		(Major: Civil Eng.)

Graham, John Mathewson, B.S. in Ch.E. (<i>Pennsylvania State College</i>)	M.S. Allentown (Major: Chemical Eng.)
Gramley, Dale Hartzler, A.B., M.S. (<i>Albright College, Columbia University</i>)	M.A. Bethlehem (Major: History)
Green, Charles Everard Joseph, B.S. in Ch.E. (<i>Lehigh University</i>)	M.S. Duluth, Minn. (Major: Chemical Eng.)
Green, William Asa, B.S. (<i>Moravian College</i>)	M.S. Bethlehem (Major: Bacteriology)
Handwerk, Ira Paul, A.B. (<i>Lafayette College</i>)	M.A. Bethlehem (Major: Education)
Hartman, Roland Franklin, B.S., Ph.B. (<i>Lehigh University, Muhlenberg College</i>)	M.A. Allentown (Major: Education)
Hartman, Wellington Pursel, B.S. (<i>Susquehanna University</i>)	M.A. Danville (Major: Education)
Harvey, Wilbur Edward, Met.E. (<i>Lehigh University</i>)	M.S. Catasauqua (Major: Metallurgy)
Hausman, Willard Monroe, B.S. (<i>Muhlenberg College</i>)	M.S. Lehighton (Major: Bacteriology)
Hawkins, Thane Edwin, B.S. in M.E. (<i>Lehigh University</i>)	Bethlehem (Major: Education)
Heim, Kenneth Ethelbert, B.A., Th.B., M.A., S.T.M. (<i>Lehigh University, Philadelphia Divinity School, University of Pennsylvania, General Theological Seminary</i>)	Reading (Major: English)
Helms, Myrtle Laura, B.A. (<i>Moravian College for Women</i>)	Hellertown (Major: English)
Herman, Lester Carl, B.S. in E.E. (<i>Lehigh University</i>)	M.S. Easton (Major: Electrical Eng.)
Holmes, Ernest George Nosworthy, Ph.B., S.T.B. (<i>Wesleyan University, Boston University</i>)	M.A. Bethlehem (Major: Philosophy)
Houser, James Francis, B.S. in M.E. (<i>University of Pittsburgh</i>)	M.S. Lebanon (Major: Mechanical Eng.)
Hoyer, Cyril Nathaniel, B.S. (<i>Moravian College</i>)	M.S. Green Bay, Wis. (Major: Physics)
Hunsicker, Harley Moyer, A.B. (<i>Goshen College</i>)	Blooming Glen
Illick, Joseph Edward, C.E. (<i>Lehigh University</i>)	M.S. Bethlehem (Major: Mathematics)
Jeanson, Charles August, III, B.S. in Ch.E. (<i>Lehigh University</i>)	M.S. Brooklyn, N.Y. (Major: Chemistry)
Jennings, Burgess Hill, B.Eng. (<i>Johns Hopkins University</i>)	M.S. Bethlehem (Major: Mechanical Eng.)

Johnston, Bruce Gilbert, B.S. in C.E. (<i>University of Illinois</i>)	M.S. Bethlehem (Major: Civil Eng.)
Kadel, George Boyer, B.S. in M.E. (<i>Lehigh University</i>)	M.S. Baltimore, Md. (Major: Mechanical Eng.)
Kantor, Max, B.Ch.Eng. (<i>University of Minnesota</i>)	M.S. Minneapolis, Minn. (Major: Chemistry)
Kaufmann, Emerson Wertz, B.S. in Ch.E. (<i>Lehigh University</i>)	M.S. Wyomissing (Major: Chemical Eng.)
Keat, Donald Bonney, B.S. (<i>Lafayette College</i>)	M.A. Bangor (Major: Education)
Kelly, Harry Charles, B.S. in Eng. Phys. (<i>Lehigh University</i>)	M.S. Wilkes-Barre (Major: Physics)
Klein, Elizabeth Charlotte, B.A. (<i>Pennsylvania State College</i>)	Bethlehem (Major: German)
Klinger, Ernst Jacob William, B.S. (<i>University of Nebraska</i>)	M.S. Hanover, Kan. (Major: Chemistry)
Klotz, Russel Richard, B.S. (<i>Muhlenberg College</i>)	M.A. Sheridan (Major: Education)
Koehler, Ruth Marie, B.S. (<i>West Chester State Teachers' College</i>)	Bethlehem
Kogge, Roy, A.A., B.S. in E.E. (<i>Lewis Institute</i>)	M.S. Chicago, Ill. (Major: Electrical Eng.)
Kost, Kenneth Karl, B.A. (<i>Lehigh University</i>)	Gary, Ind. (Major: History)
Kreibel, Denton Henry, Ph.B. (<i>Muhlenberg College</i>)	M.A. Lynnville (Major: Education)
Kuehner, Arlyle Kathleen, B.A. (<i>Moravian College for Women</i>)	M.A. Bethlehem (Major: History)
Lafferty, Isabel Morrison, A.B. (<i>Oklahoma City University</i>)	Bethlehem
Langhaar, Henry Louis, B.S. in M.E. (<i>Lehigh University</i>)	M.S. Allentown (Major: Mechanical Eng.)
Laury, Joseph Ellis, B.A. (<i>Muhlenberg College</i>)	M.A. Bethlehem (Major: Education)
Lesh, Stogdell Stokes	Bethlehem (Major: Electrical Eng.)
Lieberman, Charles Edward, B.S. (<i>Georgetown University</i>)	M.S. Allentown (Major: Chemistry)
Lillicrapp, Edgar Francis, B.S. (<i>Lafayette College</i>)	M.S. Easton (Major: Bacteriology)
Lilly, Helen Mary, B.A. (<i>Pennsylvania State College</i>)	M.A. Bethlehem (Major: Latin)
Lucas, Blanche Wingert, B.S. (<i>New York University</i>)	M.A. Allentown (Major: English)
Lucas, Frank Bernard, B.S. in E.E. (<i>Purdue University</i>)	M.S. Lafayette, Ind. (Major: Electrical Eng.)

Magyar, John Joseph, B.A. (<i>Lehigh University</i>)	M.A. Bethlehem (Major: English)
Marx, Lydia Elizabeth, A.B. (<i>Salem College</i>)	M.A. Nazareth (Major: Latin)
Metzgar, Esta Eleanor, Ph.B. (<i>Muhlenberg College</i>)	M.A. Allentown (Major: History)
Mumbauer, Eleanor Dengler, B.A. (<i>Moravian College for Women</i>)	Bethlehem
Myers, Philip Benham, B.A. (<i>Lehigh University</i>)	M.S. Kingston (Major: Geology)
Napravnik, Joseph, B.S. in Ch.E. (<i>Lehigh University</i>)	M.S. Freemansburg (Major: Chemistry)
Nicholas, Dorothy Louise, A.B. (<i>Hood College</i>)	M.A. Allentown (Major: Psychology)
Nichols, David Perry, B.S. in I.E. (<i>Lehigh University</i>)	M.S. Pennington, N.J. (Major: Mechanical Eng.)
Nonnemaker, Warren Francis, B.A., B.D. (<i>Moravian College</i>)	M.A. Bethlehem (Major: History)
Ortt, Elwood Lesher, A.B. (<i>Muhlenberg College</i>)	M.A. Emaus (Major: Latin)
Osborn, Harry Brooks, Jr., B.S. in Ch.E. (<i>Lehigh University</i>)	M.S. Newark, N.J. (Major: Chemistry)
Parmet, Bessie, B.A. (<i>Cedar Crest College</i>)	M.A. Allentown (Major: English)
Paulsen, Edgar Peter, B.S. (<i>Muhlenberg College</i>)	M.A. Lehighton (Major: History)
Pottschacher, Stephen	M.A. Iron Hill (Major: Philosophy)
Rabinowitz, Benjamin, B.S. in Ch.E. (<i>Lehigh University</i>)	M.S. Scranton (Major: Chemistry)
Reynolds, Peter Graham, B.S. in M.E. (<i>Lehigh University</i>)	M.S. Bethlehem (Major: Mechanical Eng.)
Ridgley, Cornelius Joseph, B.S. in E.E. (<i>New York University</i>)	M.S. Washington, D.C. (Major: Electrical Eng.)
Rogers, Alfred Nathan, B.S. in Ch.E., M.S. (<i>Lehigh University</i>)	Reading
Rosencrans, Charles Arthur, B.S. in E.E. (<i>Lehigh University</i>)	M.S. Warwick, N.Y. (Major: Electrical Eng.)
Ryan, Michael Joseph, B.A. (<i>Lehigh University</i>)	M.A. Bethlehem (Major: Education)
Sachs, Helen Margaret, A.B. (<i>College of St. Elizabeth</i>)	M.A. Bethlehem (Major: History)
Schantz, Paul Ellis, Jr., B.S. (<i>Muhlenberg College</i>)	M.A. Allentown (Major: Education)

Schlegel, Martha Marie, B.A. (<i>Moravian College for Women</i>)	M.A. Allentown (Major: English)
Schlotter, Ellwood Steffan, Ph.B. (<i>Muhlenberg College</i>)	M.A. Bethlehem (Major: Education)
Secor, Sanford A., B.S. (<i>Stroudsburg State Teachers College</i>)	M.A. East Stroudsburg (Major: Education)
Seyfried, Elwood Henry, B.S. (<i>Moravian College</i>)	M.A. Bethlehem (Major: Education)
Shankweiler, Ray Gernert, B.S. in E.E. (<i>Lehigh University</i>)	M.S. Allentown (Major: Electrical Eng.)
Shannon, Francis Patrick, B.S., B.S. in M.E. (<i>Canisius College, Lehigh University</i>)	M.S. Buffalo, N.Y. (Major: Mechanical Eng.)
Shimer, Stewart Applegate, Jr., B.S. in Eng. Phys. (<i>Lehigh University</i>)	M.S. Bethlehem (Major: Physics)
Smith, William Coventry Waddell, B.S. (<i>Princeton University</i>)	M.S. Princeton, N.J. (Major: Chemical Eng.)
Snyder, Harry Drew, B.S. (<i>Lafayette College</i>)	Easton
Stewart, Betty Rahn, B.A. (<i>Cedar Crest College</i>)	M.A. Bethlehem (Major: English)
Swain, Henry George, A.B., M.A. (<i>Swarthmore College, Lehigh University</i>)	East Orange, N.J.
Tallmadge, Alice Parker, A.B., A.M. (<i>Mt. Holyoke College</i>)	Allentown
Thierolf, Russell Lloyd, B.S. (<i>Lafayette College</i>)	M.A. Bethlehem (Major: Education)
Thom, George Boyd, M.E., M.S. (<i>Lehigh University</i>)	Llanerch
Thorne, Albert Monforte, Jr., B.S. (<i>Lehigh University</i>)	M.S. Richmond Hill, (Major: Physics) N.Y.
Todd, Anna May, B.A. (<i>Moravian College for Women</i>)	M.A. Bethlehem (Major: Latin)
Ueberroth, Florence Scholl, B.S. (<i>Elmira College</i>)	M.A. Bethlehem (Major: Education)
Vanderbush, Walter Harry, B.S. (<i>Lafayette College</i>)	M.A. Dover, N.J. (Major: Education)
Ware, Allen Theodore, B.S. in Bus. (<i>Lehigh University</i>)	Glassboro, N.J.
Weiss, David Gradwohl, B.A. (<i>Pennsylvania State College</i>)	M.A. Bethlehem (Major: English)
Wiegner, James Robert, B.S. in Ch.E. (<i>Lehigh University</i>)	M.S. Bethlehem (Major: Chemistry)
Williams, Benjamin Crispin, Ph.B. (<i>Lafayette College</i>)	M.A. Catasauqua (Major: Education)
Youngkin, Edward Herbert, B.S. (<i>Lafayette College</i>)	M.A. Easton (Major: History)

UNDERGRADUATE STUDENTS

Arts—Arts and Science	E.M.—Mining Engineering
Bus.—Business Administration	Eng.—Freshman Engineering
Ch.E.—Chemical Engineering	I.E.—Industrial Engineering
Chem.—Chemistry	M.E.—Mechanical Engineering
C.E.—Civil Engineering	Met.—Metallurgical Engineering
E.E.—Electrical Engineering	Phys.—Engineering Physics

Abbe, Richard Taylor	Bus.,'34	Kennett Square
Abbe, Robert	Bus.,'35	Kennett Square
Abrahams, Moses	Arts,'33	New York, N.Y.
Abrams, Simon Mervin	E.E.,'35	Freeland
Abse, David Isadore	Bus.,'35	Bethlehem
Ackerman, Cleon Cleveland	Chem.,'34	Lancaster
Ackerson, Cornelius	E.E.,'35	Keyport, N.J.
Adamson, John Howard	Arts,'36	Meyersdale
Agocs, William Bailey	E.M.,'34	Freemansburg
Alberts, Aaron Arnold	Bus.,'35	Waterbury, Conn.
Alexander, Elbert Nicholas	Eng.,'36	Abington
Alexander, Jay Lewis	Bus.,'34	Pittston
Alleman, Gellert Spencer	Arts,'34	Wallingford
Allen, Charles Barnett	Eng.,'36	Philadelphia
Allen, Fred George	Bus.,'36	Wadsworth, O.
Allison, Robert Price, Jr	Eng.,'36	Schenectady, N.Y.
Alper, Norman	Arts,'34	Providence, R.I.
Ambruster, Watson, II	M.E.,'35	Westfield, N.J.
Anamisakis, Anthony Fotis	Bus.,'34	Bethlehem
Anderson, Donald Herbert	Arts,'33	Pittsburgh
Anderson, James Evans	Arts,'33	Tottenville, N.Y.
Anderson, Lloyd David	E.E.,'34	Red Lion
Anderson, Malcolm	Arts,'36	New York, N.Y.
Andrews, Richard Allen	I.E.,'33	Salt Lake City, Utah
Antoniotti, John James	C.E.,'33	Union City, N.J.
Antrim, William Drown, Jr.	Eng.,'36	Gloucester, N.J.
Ardolino, Edward John	Arts,'36	Metuchen, N.J.
Aucott, William Connery	M.E.,'34	Philadelphia
Aufhammer, John Alan	Bus.,'33	Pittsburgh
Austin, William Edward	Eng.,'36	Maplewood, N.J.
Ayer, Fosdick Whitney	I.E.,'33	Plainfield, N.J.
Ayers, Allan, Jr.	I.E.,'33	Springfield, Mass.
Bachman, Robert Ruch	Bus.,'33	Drexel Hill.
Bachman, Walter Crawford	I.E.,'33	Nazareth
Bade, Harold William	Bus.,'36	Belleville, N.J.
Baer, Richard Price, II	Eng.,'36	Baltimore, Md.
Bagenski, Frank	Bus.,'36	Hempstead, N.Y.
Bailey, Albert Tanner, Jr.	M.E.,'34	Montclair, N.J.
Bailey, Benjamin Cook	C.E.,'35	Wallingford, Conn.
Bailey, Joseph Taylor	Eng.,'36	Bloomfield, N.J.

Bailey, Oakford Chandler	I.E.,'33	Pennsville, N.J.
Baillie, John William	Ch.E.,'34	Bethlehem
Baizley, Rudolph Suttcliffe	Bus.,'36	Philadelphia
Baker, Arthur Ephraim	Bus.,'35	Jamaica, N.Y.
Baker, Joseph Boyd	C.E.,'34	Pittsburgh
Baker, William Perry	Bus.,'33	New Rochelle, N.Y.
Baldwin, Sheldon Reynolds	Bus.,'36	Cincinnatus, N.Y.
Ball, Hiram Price	Bus.,'36	Pittsburgh
Balliet, Claude Samuel	Eng.,'36	Catasauqua
Bamert, William	Bus.,'35	South Orange, N.J.
Bangsberg, Robert Ethan	E.E.,'33	LaCrosse, Wis.
Barker, Charles Griffin, Jr.	Arts,'35	Vineland, N.J.
Barnes, Allen Earl, Jr.	C.E.,'34	Philadelphia
Barney, Jerome	M.E.,'33	Wilkes-Barre
Barrow, George Robert	Met.,'34	Enola
Bartlett, Clark Orrin	Eng.,'36	Maplewood, N.J.
Baum, August Hinrichs	Bus.,'35	Westfield, N.J.
Bauman, Maurice	Arts,'33	New York, N.Y.
Baumann, Leonard Leopold	Arts,'36	Liberty, N.Y.
Bavington, Robert Francis	Bus.,'34	Philadelphia
Baxter, Malcolm Hume	Ch.E.,'35	New York, N.Y.
Bayer, Curtis Frederick	Bus.,'36	Scarsdale, N.Y.
Beach, Benjamin DeWitt	E.E.,'33	Montrose
Beacher, Benjamin Donald	E.E.,'35	Allentown
Beal, Thomas James	C.E.,'35	Meyersdale
Beatty, Kenneth Orion	Ch.E.,'35	Drexel Hill
Beeson, Colin Reed	Bus.,'35	Four States, W.Va.
Beidler, Henry Landis	Eng.,'36	Quakertown
Beidler, John Kaufman	Bus.,'35	Oakville
Beiter, Harry Nevison	Bus.,'35	Elyria, O.
Bell, George Tillman	Bus.,'34	Washington, D.C.
Bell, James McKim, Jr.	C.E.,'34	Rio de Janeiro, Brazil, S.A.
Belzer, Anthony Albert, Jr.	I.E.,'35	Plainfield, N.J.
Bene, Frank	Arts,'33	Bethlehem
Benner, Henry Lester	Eng.,'36	Lederach
Bennett, Charles Albert	Bus.,'33	White Plains, N.Y.
Bennett, Charles Eugene	Bus.,'36	West Hempstead, N.Y.
Bennett, Chester Earl	Arts,'36	Belmar, N.J.
Benson, Arthur Leonard	Arts,'33	Easton, Md.
Bentz, Russell Herman	Ch.E.,'35	York
Berg, Lloyd	Eng.,'36	Paterson, N.J.
Berg, Parker	Arts,'35	Sewickley
Berger, Jerome James	Bus.,'35	Peekskill, N.Y.
Berkowitz, Morton Seymour	Arts,'36	Newark, N.J.
Berlin, Aaron Samuel	Ch.E.,'33	Wilmington, Del.
Berman, Morton	Eng.,'36	Norristown
Bernstein, Gerald Alan	Arts,'33	New York, N.Y.
Bernstein, Maurice	Arts,'33	East Orange, N.J.
Besosa, Frank Adolfo	Bus.,'34	Flushing, N.Y.
Bewley, Frank Wilson	Ch.E.,'34	Pottstown

Beyer, Arnold John	Eng., '36	Allegany, N.Y.
Bickel, Harold Clayton	Eng., '36	Philadelphia
Bigelow, Claude Illingsworth	Ch.E., '35	Rockville Centre, N.Y.
Bilger, Walter Gibson	E.M., '35	Philadelphia
Bilinsky, Anthony	Arts, '36	Freeland
Billheimer, George Lee	Arts, '34	Harrisburg
Biondi, Frank Joseph	Eng., '36	Allentown
Biro, Frank	Arts, '33	Bethlehem
Bishop, Ben Leon	Arts, '34	Manheim
Black, Lewis Charles	E.M., '35	Gloucester City, N.J.
Blanchard, Francis Wood	M.E., '35	Pennington, N.J.
Blasky, Harold Fredric	Bus., '35	Newark, N.J.
Blass, Lamar Kostenbauder	Eng., '36	Aristes
Bloom, Kenneth Gordon	Bus., '35	Agawam, Mass.
Blumenthal, Samuel Kahn	Arts, '35	Elkins Park
Blythe, Ralph Masland	E.M., '35	Philadelphia
Bock, Charles Frederick	Eng., '36	Caldwell, N.J.
Boden, Marston Hall	Eng., '36	Flushing, N.Y.
Bohning, William Harvey	Arts, '34	Bethlehem
Bolton, Wilson W., Jr.	Bus., '34	York
Bomberger, David Claude	E.E., '34	Reading
Bonkemeyer, Amos Colbert, Jr.	Eng., '36	Greensboro, N.C.
Bonnell, Horace Wilson	M.E., '35	Aberdeen, Md.
Boquel, Francis Peter	Bus., '33	Bethlehem
Boquel, Joseph Peter	Bus., '35	Bethlehem
Borden, Kennard Fleming	M.E., '33	Collingswood, N.J.
Borton, Richard Alwyn	Ch.E., '35	South Orange, N.J.
Bosak, Joseph John	M.E., '35	Olyphant
Bounds, Ardrey Middleton	Met., '33	Philadelphia
Bowden, Charles Warren, Jr.	Eng., '36	Philadelphia
Bowden, George Smith	Arts, '34	Nutley, N.J.
Boyd, Robert Putnam	E.M., '33	Staten Island, N.Y.
Brader, James Clarence	Bus., '35	Nanticoke
Brader, Kenneth K.	Eng., '36	Catasauqua
Branda, Richard Randolph	E.M., '34	Hamilton, Ont., Canada
Brandt, Charles Cox, Jr.	E.E., '35	Newport
Branegan, James Augustus	Ch.E., '35	Drexel Hill
Brant, Irvin Longaker	Bus., '36	Norristown
Braun, Robert Carl	Ch.E., '33	Reading
Braunberns, James Edward	Met., '35	Warren, O.
Bray, Joseph Moyer	Eng., '36	Freeland
Bray, William Edwin	Arts, '33	Freeland
Brettell, George Alvin, Jr.	Eng., '36	Newark, N.J.
Brewer, Leonard	Ch.E., '35	Delaware Water Gap
Bricker, Irving	Arts, '36	Roxbury, Mass.
Brisker, Sydney Hirsch, II	I.E., '35	Bethlehem
Britton, Horace Ely	Bus., '35	Kent, Conn.
Brobst, William Charles	M.E., '35	Palmerton
Brodhead, Woodruff Martin	I.E., '34	Elizabeth, N.J.

Brounstein, Jesse Bayliss	Bus.,'33	Allentown
Brooks, Harold Taylor	Eng.,'36	Upper Montclair, N.J.
Brown, Joseph Francis	Eng.,'36	Lyndhurst, N.J.
Brown, Ralph Wilson	I.E.,'35	Plainfield, N.J.
Brown, Silas Mahona, Jr.	Eng.,'36	Bethlehem
Browne, Gerard Lakin	Arts,'36	Buffalo, N.Y.
Brownlee, John Frederick	I.E.,'35	Geneva, N.Y.
Brumbach, George Edward	Met.,'33	Esterly
Brunn, Herbert Theodore	Bus.,'34	Brooklyn, N.Y.
Buchanan, Robert Williams	Arts,'35	Maplewood, N.J.
Buchanan, William Christian	I.E.,'33	Philadelphia
Buck, Richard Benn	Arts,'34	Williamstown, N.J.
Budura, Paul	Arts,'35	Bethlehem
Bugbee, Charles Kendall	Eng.,'36	Trenton, N.J.
Bullard, Joseph William		
Camp, Jr.	Eng.,'36	Southport, Conn.
Burg, Robert Joseph	Bus.,'34	Bethlehem
Burlihouse, William Alfred	Arts,'34	Drexel Park
Burk, Russell Williams	Arts,'33	Newark, N.J.
Burke, Thomas William	Arts,'34	Allentown
Burkhardt, Michael Ferdinand	Arts,'36	Bethlehem
Butterfield, John Parker	Eng.,'36	Bethlehem
Butterfield, Thomas Edward, Jr.		
Butz, George Alpha	Arts,'35	Bethlehem
Byers, Lewis Cunningham	Eng.,'36	Schuylkill Haven
Byers, Richard McCulloch	C.E.,'33	Catonsville, Md.
Byrne, Phillip Joseph	E.E.,'34	Catonsville, Md.
Cabassa, Herman Forrest	Arts,'36	Bethlehem
Cahalan, William James	C.E.,'34	West Chester
Calhoun, Lawson Peel	Ch.E.,'35	East Orange, N.J.
Campbell, Charles, Jr.	Eng.,'36	Atlanta, Ga.
Campbell, Charles, Jr.	I.E.,'34	Fullerton
Campbell, James Bannon	Bus.,'33	Pittsburgh
Campbell, William Francis, Jr.	Arts,'35	Pittsburgh
Canfield, William Benjamin	Eng.,'36	Nyack, N.Y.
Canning, Francis Joseph	Ch.E.,'35	Caldwell, N.J.
Canonico, Stephen	Arts,'35	Cranford, N.J.
Canova, Remo	E.M.,'33	Red Bank, N.J.
Capozzolo, Joseph	Arts,'34	Allentown
Carhart, Gregory	Arts,'33	Pen Argyl
Carl, Howard Frederick	Eng.,'36	Springfield, Mass.
Carlile, Norman Alfred Henry	Phys.,'33	Washington, D.C.
Carr, Merton Crawford	E.M.,'34	Philadelphia
Carrillo, Andres, Jr.	Bus.,'34	Buffalo, N.Y.
Case, Roy Irving	Chem.,'34	Habana, Cuba
Cavanagh, William Edward, Jr.	E.E.,'35	Racine, Wis.
Cavin, Samuel Stewart	Met.,'34	Newark, N.J.
Chambers, Charles Reed	Bus.,'36	Upper Darby
Chapin, Henry Merritt	Bus.,'34	Audubon, N.J.
	Ch.E.,'33	Flushing, N.Y.

Chapman, Alfred George	Eng.,'36	Carbondale
Chapman, Denman Scott	Bus.,'35	Milwaukee, Wis.
Charles, William Henry, Jr.	I.E.,'33	Riverside, Ill.
Charlton, James Maxwell	Bus.,'34	Scarsdale, N.Y.
Chickering, Edwin Shepard	I.E.,'35	Oil City
Christman, Edward Charles	Bus.,'36	Nazareth
Citro, Louis Eugene	Arts,'35	Freeland
Clark, Diar Ellsworth	E.E.,'34	Deposit, N.Y.
Clark, James Monroe	Bus.,'35	Washington, D.C.
Clarke, Joseph Murray	I.E.,'35	Sparrows Point, Md.
Clauss, John Herbert	Bus.,'36	Brooklyn, N.Y.
Clauss, Theodore	Bus.,'33	Brooklyn, N.Y.
Claypoole, Richard Wilbur	I.E.,'33	Freeport
Cliver, Lawrence Gordon	Ch.E.,'34	Tottenville, N.Y.
Close, Courtney Taft	E.E.,'34	Dunmore
Clow, Wesley Ludlow	Eng.,'36	Pine Castle, Fla.
Coburn, John Walton	Arts,'35	Philadelphia
Coe, Edwin Merritt	M.E.,'33	Suffern, N.Y.
Coffey, John Vincent	Arts,'36	Bethlehem
Cohen, Arthur Stanley	Arts,'35	Hagerstown, Md.
Cohen, Bernard Louis	Arts,'36	Albany, N.Y.
Cohen, Saul Allen	Arts,'33	Lewistown
Cohn, William Phineas	Bus.,'33	New York, N.Y.
Colbaugh, Robert Crawford, Jr.	Eng.,'36	Wilkinsburg
Colitz, Michael John	C.E.,'35	Pottsville
Coll, Christopher Thomas, Jr.	Bus.,'36	Allenhurst, N.J.
Collander, Carl Edward	C.E.,'35	Newark, N.J.
Collins, Clyde Abraham	Arts,'36	Scranton
Collins, Edmund III	Bus.,'36	Allentown
Comins, Harrison Durgin	C.E.,'33	Vineland, N.J.
Comstock, Walter Goemann	Bus.,'36	Grantwood, N.J.
Conti, Arthur	Arts,'36	Brooklyn, N.Y.
Conti, Vincent	Arts,'34	Brooklyn, N.Y.
Coogan, Charles Halpin	C.E.,'35	East Orange, N.J.
Cook, Weston Carrier	Arts,'36	Allentown
Cook, William Franklin	M.E.,'33	Sylvan
Cooke, Thomas Dickerson	Bus.,'35	Kenilworth, Ill.
Cooley, Charles Freeland	Ch.E.,'35	Pennington, N.J.
Cooper, Charles William	E.E.,'33	Sewickley
Cooper, Donald Treat	Eng.,'36	Philadelphia
Cooper, John Kenneth	Bus.,'36	Forty Fort
Cooper, Lloyd Ryder	Ch.E.,'35	Coopersburg
Cooper, Malcolm Everett	I.E.,'33	Paterson, N.J.
Cooper, William Herbert	I.E.,'35	Drexel Hill
Cornelius, John deBenneville	Arts,'35	Wynnewood
Corson, Howard Allen	Eng.,'36	Goshen, N.J.
Cottrell, Alfred	E.E.,'34	Washington, D.C.
Couch, Robert de Schweinitz	Eng.,'36	Bethlehem
Coventry, John Roberts	Bus.,'36	Hibbing, Minn.

Cowenhooven, John, III	I.E.,'35	East Orange, N.J.
Cox, Irving John, Jr.	Eng.,'36	Wilmington, Del.
Coxe, Charles Dickey	Met.,'33	Uniontown
Coxe, Nelson Yeomans	M.E.,'34	Uniontown
Craft, Norman Willet	Ch.E.,'35	Cedarhurst, N.Y.
Crane, William	Bus.,'36	Westfield, N.J.
Cranmer, Richard Stephen	Arts,'36	Philadelphia
Cressman, John Alton	Eng.,'36	Cementon
Crichton, Clarendon Nelson	Arts,'33	Johnstown
Crispen, Hibberd Reese	E.M.,'33	Harrisburg
Crockett, Walter Prentice	Eng.,'36	Lancaster
Croll, Arthur	Eng.,'36	Buffalo, N.Y.
Crouse, William Burrill	Bus.,'33	Philadelphia
Croushore, James Henry	Arts,'36	Bethlehem
Culver, Donald Cooper	Phys.,'35	Laurel, Del.
Cummings, Vail William	Eng.,'36	Maplewood, N.J.
Cunningham, Frederick Noel	I.E.,'33	Bethlehem
Curtis, Roger Sumner	Eng.,'36	Devon
Custer, Robert Hutchinson	Eng.,'36	Mount Vernon, N.Y.
Daddow, Theodore R., Jr.	Eng.,'36	Pottsville
Dalling, Robert Henry	Bus.,'34	Stillwater, N.J.
Danser, Lowry Scattergood	Ch.E.,'33	Yardley
Davenport, Theodore	Eng.,'36	Netcong, N.J.
Davia, Ralph Dravo	Eng.,'36	Dormont
David, David Gabriel	Ch.E.,'35	Philadelphia
Davis, Albert Winston	Bus.,'36	Plainfield, N.J.
Davis, Berton Emerson	Eng.,'36	Scranton
Davis, David Frost	Eng.,'36	Hawthorne, N.J.
Davis, John Lawrence	Bus.,'36	Perth Amboy, N.J.
Davis, John Miller	Bus.,'35	Philadelphia
Davis, Norval Baron	Bus.,'35	Wheeling, W.Va.
Davis, Robert Lincoln	I.E.,'33	Norfolk, Va.
Davis, William Robert	Ch.E.,'33	Lansford
Day, Gaylord Hill	Arts,'33	Lyons, N.J.
Deacy, William Henry, III	Eng.,'36	Ossining, N.Y.
Deale, Blair Bowditch	Bus.,'36	Greenport, N.Y.
Dean, John Paterson	Arts,'33	Morristown, N.J.
Dean, Russell Tattershall	Ch.E.,'33	Bethlehem
deBerardinis, Vincent Anthony	C.E.,'33	Chester
Decker, Lemoyne Eugene	Ch.E.,'33	Harrisburg
Decker, Robert Edgar	Bus.,'34	Great Neck, N.Y.
Deemer, Walter Lorraine, Jr.	Arts,'35	Quakertown
DeForest, Edward Tucker	M.E.,'34	Newark, N.J.
Deibert, Edward Bader	Bus.,'36	Hellertown
Deily, Richard Leo	Arts,'33	White Plains, N.Y.
Delano, Frank	Bus.,'33	Bloomfield, N.J.
DelFavero, Louis Vincent	C.E.,'35	Columbia, N.J.
Demarest, Harold Hunt	Bus.,'34	Bloomfield, N.J.
deMeli, Henry Anthony	Bus.,'35	New Brighton, N.Y.

Dempsey, Thomas Francis	Arts,'34	Bethlehem
deNarvaez, Charles Agustin	Eng.,'36	Bogota, Colombia, S.A.
Dengel, Arthur John	Eng.,'36	Westbury, N.Y.
Dengler, Robert Meyer	I.E.,'33	Shenandoah
Denise, Charles Meirs, Jr.	C.E.,'35	Bethlehem
DePuy, Edward DeWitt	Eng.,'36	Brooklyn, N.Y.
Derrico, Charles	Bus.,'34	New York, N.Y.
DeTurk, Elder Pattison	Ch.E.,'34	Reading
Deweese, George Malcolm	Ch.E.,'34	West Chester
Dickerson, Randal Levin	Ch.E.,'35	Laurel, Del.
Dickinson, Lee Irving	Eng.,'36	Buffalo, N.Y.
Dickover, George Fancourt	Eng.,'36	Kingston
Diefenbach, James Cummins	Bus.,'33	Westfield, N.J.
Diefenbach, John Bauer	Arts,'35	Westfield, N.J.
Diefenthaler, David Arnold	Bus.,'36	Chatham, N.J.
Diener, Karl Miller	Bus.,'34	Hamburg
Dieter, Emil Allen	Arts,'36	Allentown
Dietz, Carl Alford	Eng.,'36	Summit, N.J.
Dietz, John Wilson	Bus.,'36	Summit, N.J.
Dinkel, Jack Creighton	Bus.,'33	Buffalo, N.Y.
Dix, Thomas Simpson, Jr.	Eng.,'36	Merchantville, N.J.
Dodd, Richard Caspar	Arts,'36	Sea Girt, N.J.
Dornin, George Armstrong, Jr.	M.E.,'35	Baltimore, Md.
Doubleday, Thomas Patten	Bus.,'34	Cooperstown, N.Y.
Dougherty, Robert Starrs Aloysius, Jr.	Bus.,'36	Bethlehem
Dow, Langdon Cheves	Bus.,'33	Trucksville
Downing, Robert Edward	Eng.,'36	Hudson, N.Y.
Dresher, Melvin	Phys.,'33	Hackensack, N.J.
Dreyfus, Jack Jonas, Jr.	Arts,'34	Montgomery, Ala.
Driscoll, Robert Cameron	Eng.,'36	Drexel Hill
Druckerman, Bert Abraham	Arts,'33	Brooklyn, N.Y.
Duke, William Harrison	Eng.,'36	Corning, N.Y.
Dunlap, Harold Frederick	Bus.,'36	Altoona
Dunlap, William Berger	Eng.,'36	Pittsburgh
Eagan, John William, Jr.	Met.,'34	Youngstown, O.
Earich, Robert Allen George	Chem.,'34	Bethlehem
Ebert, David Mathias	Ch.E.,'34	Wilmington, Del.
Eby, Martin Christian	Ch.E.,'34	New Holland
Eckstein, David	Arts,'34	Trenton, N.J.
Eddleman, Edward Maurice	Bus.,'34	Philadelphia
Edgcumbe, Charles Diehl	Eng.,'36	Roselle Park, N.J.
Edwards, John Beitel	Eng.,'36	Bethlehem
Efron, Samuel	Arts,'35	Allentown
Ehlers, Henry Edward, Jr.	Bus.,'34	Philadelphia
Ehmann, Neville Howell	Eng.,'36	Brookline
Eichelberger, Lewis Hay, Jr.	M.E.,'34	Eagle Pass, Tex.
Eichner, Robert Mills	Eng.,'36	Upper Montclair, N.J.
Eisenstadt, Gilbert Stanley	Arts,'34	Brooklyn, N.Y.

Ellis, Harry Kaler, Jr.	E.E.,'35	Phoenixville
Ellison, Stanley Russell	I.E.,'36	South Orange, N.J.
Ellstrom, John Randolph	Chem.,'33	Bethlehem
Emery, Walter Earl	E.E.,'33	Mount Bethel
Engel, Edwin Herman	Met.,'34	Plainfield, N.J.
Engelman, Louis Jacobs	Bus.,'33	Yonkers, N.Y.
English, Earl Rowland	Bus.,'34	Upper Montclair, N.J.
English, Harrison Force, III	Arts,'34	Trenton, N.J.
Engstrom, Victor Eugene	Bus.,'36	Upper Montclair, N.J.
Enke, George Pryor, Jr.	I.E.,'33	East Orange, N.J.
Enscoe, Roger	C.E.,'35	Port Washington, N.Y.
Enzian, George Henry	Met.,'35	Pittsburgh
Ertle, Lawrence Joseph	Ch.E.,'35	Pittsburgh
Escobedo, Gilberto	Eng.,'36	Mexico City, Mexico
Evans, David Daniel	M.E.,'34	Scranton
Evans, Foster William	Eng.,'36	Reading
Evans, John Orville	Ch.E.,'34	Washington, D.C.
Evans, Morton Ridgway	Eng.,'36	Glen Rock, N.J.
Evans, Paul Davies	Phys.,'35	Summit, N.J.
Everett, Harvey James	M.E.,'35	Allentown
Everett, William Wade, Jr.	Bus.,'35	Washington, D.C.
Eyster, Franklin Spangler	Bus.,'33	York
Farnham, Robert, Jr.	Arts,'36	Philadelphia
Farnsler, Herbert Forrest	Eng.,'36	Harrisburg
Faust, Delbert Grant	E.E.,'34	Philadelphia
Fay, Joseph Edmund	I.E.,'35	West Pittston
Fehr, Harold George	Eng.,'36	Pen Argyl
Feinberg, Albert Stanley	Eng.,'36	Allentown
Feldman, Harry Alfred	Arts,'35	Newark, N.J.
Felton, Walter Wiest	E.E.,'33	Columbia
Fenner, Bayard Church, Jr.	Bus.,'34	South Orange, N.J.
Fentress, David Wendell	Bus.,'36	Hubbard Woods, Ill.
Ferguson, John Berton, Jr.	Eng.,'36	Hagerstown, Md.
Ferris, John Guy	C.E.,'34	Allentown
Ferry, John Jude	Ch.E.,'34	Bethlehem
Filer, Frank P.	Eng.,'36	Mercer
Finlay, Walter Leonard	Eng.,'36	Brooklyn, N.Y.
Fischer, David Dave	Arts,'33	Long Branch, N.J.
Fishel, John Beverly	Eng.,'36	Hagerstown, Md.
Fisher, Harry Mueller	Ch.E.,'34	Drexel Hill
Fisher, Karl Albert	Ch.E.,'33	Kutztown
Fisher, William Wallace, Jr.	I.E.,'34	Orange, N.J.
Fismer, William Lucius	M.E.,'34	Verona, N.J.
Fitzpatrick, Ralph Norris	Met.,'33	Great Neck, N.Y.
Flanigan, Pierce John, Jr.	C.E.,'33	Baltimore, Md.
Fleischer, Edward	Arts,'33	Bethlehem
Flisher, Leonard Hawkins	Arts,'34	Oakville, Conn.
Foering, Howard Augustus, Jr.	Eng.,'36	Bethlehem
Foland, Jackson Edward	Eng.,'36	North Plainfield, N.J.

Folkner, Maurice Harvey	Met.,'35	Buttzville, N.J.
Ford, Charles Harry	Eng.,'36	Forest Hills, N.Y.
Ford, Hamilton Gates	Bus.,'34	Ridgewood, N.J.
Ford, Howard Holmes, Jr.	Bus.,'35	Ridgewood, N.J.
Ford, Howard Lay	Bus.,'36	Upper Montclair, N.J.
Ford, William Michaux	Bus.,'33	New Harmony, Ind.
Forgeng, Louis William	Eng.,'36	Scranton
Fortman, Bernard Gerard	I.E.,'34	Pearl River, N.Y.
Foster, Kenneth Leroy	I.E.,'34	Rockville Center, N.Y.
Fountain, James Hopkins	Bus.,'33	Easton, Md.
Fouse, Donald Weber	Eng.,'36	Harrisburg
Fox, Beauvais Baugh, Jr.	I.E.,'33	New York, N.Y.
Frace, John William	Arts,'33	Easton
Frankenfield, Charles Walter	M.E.,'34	Coopersburg
Frauenfelder, Lewis Jacob	Eng.,'36	Topton
Frazee, Edward Blackwell	Chem.,'35	Bethlehem
Frederick, Ralph Horace	Ch.E.,'33	East Greenville
Freeborn, Fair Cobb	Eng.,'36	Proctor, Vt.
Freed, Howard Biehn	Arts,'36	Quakertown
Freed, William Charles	Eng.,'36	Richlandtown
Freeman, Charles David	Bus.,'36	Nazareth
Freiday, Donald Herbert	M.E.,'33	East Orange, N.J.
French, Walter Clayton	M.E.,'33	Philadelphia
Frick, Bernard LeRoy	C.E.,'34	Lebanon
Frick, Charles Edward, Jr.	M.E.,'35	Philadelphia
Frick, John Arthur, Jr.	Bus.,'36	Allentown
Friedman, Milton Jay	Arts,'33	Brooklyn, N.Y.
Frishmuth, Robert Biddle	Eng.,'36	Monticello, Fla.
Fritts, James Anthony	Arts,'33	Phillipsburg, N.J.
Fritz, Charles Leslie	Bus.,'34	Westfield, N.J.
Fritz, John Raymond	E.E.,'33	Reading
Fruehan, Willard	Met.,'35	Scranton
Frutiger, Thomas William	I.E.,'33	Red Lion
Fry, Nelson Becker, Jr.	I.E.,'34	Bala-Cynwyd
Frye, John H., Jr.	Met.,'33	Birmingham, Ala.
Fugard, John Reed	C.E.,'35	Evanston, Ill.
Fuller, Charles Arthur, Jr.	Arts,'34	Mount Vernon, N.Y.
Fuller, Donald Craig	Bus.,'36	Summit, N.J.
Fuller, James Osborn	Arts,'33	Bethlehem
Fulweiler, John Herbert	Arts,'33	Wallingford
Furman, Millard Robert	Bus.,'35	Newark, N.J.
Gabell, Boyden Richardson	Bus.,'36	Philadelphia
Gallagher, Charles Edward	Eng.,'36	Cleveland Heights, O.
Gallagher, Edward Charles	Bus.,'36	Allentown
Gallagher, Edward Spring	Eng.,'36	Great Neck, N.Y.
Gallaher, Howard Scott	Eng.,'36	Trenton, N.J.
Gallaway, William Smith	Phys.,'35	Rutherford, N.J.
Galligher, John	Bus.,'35	Washington, D.C.
Garber, John Franklin	Ch.E.,'33	Lumberville

Garihan, Thomas Kenneth, Jr.	Bus.,'36	Bethlehem
Garrett, Robert Heil	C.E.,'33	Frackville
Gates, Barnard Nieweg	Arts,'35	Tyrone
Gates, Newman Vinal	Eng.,'36	Devon, Conn.
Gavin, John Daniel	Eng.,'36	Catasauqua
Gearhart, Foster Lane	I.E.,'34	Palmerston
Gearhart, Thomas Allen	Arts,'36	Palmerston
Geehr, Homer Pyle	E.E.,'35	Quincy, Mass.
Geiger, Franklin Ezra	E.E.,'34	Hackensack, N.J.
Geiger, Lyle McCleary	Eng.,'36	Braddock
Geller, Samuel Cortley	Bus.,'34	Pittsfield, Mass.
George, Henry Peter	Ch.E.,'35	Palmerston
Gerlach, Earl Levingood	Bus.,'36	DoylesTown
Gerth, Harry John	Bus.,'33	Rockville Center, N.Y.
Gibbs, Harold Arthur, Jr.	Eng.,'36	Jersey City, N.J.
Gibbs, Wilbur Mercer	C.E.,'33	White Haven
Gibson, Glenn James	C.E.,'35	Hampton, N.J.
Gilmore, John Arthur	Arts,'35	California
Glading, Alfred Decatur, Jr.	Eng.,'36	Haddonfield, N.J.
Glassford, Donald Carson	Ch.E.,'35	Baltimore, Md.
Glick, Elmer William	Arts,'33	Bethlehem
Glickman, Paul Seymour	Arts,'35	Newark, N.J.
Godfrey, Norman Maitland	Eng.,'36	Passaic, N.J.
Godshall, William Herbert	Eng.,'36	Lansdale
Gold, Arthur Jack	Bus.,'33	Trenton, N.J.
Gold, Lester Charles	Arts,'34	Bethlehem
Goldsmith, John Joseph	Bus.,'36	Cleveland Heights, O.
Goldsmith, Poe Tennyson Longfellow	Eng.,'36	Catasauqua
Goldstein, Morris	Bus.,'35	New York, N.Y.
Gonzalez, Frank Aurelio	Bus.,'36	Brooklyn, N.Y.
Goodrich, George Edward, Jr.	I.E.,'34	Bedford
Goodrich, Stanley Raymond	Bus.,'35	Belleville, N.J.
Gordon, David Wilkie	Bus.,'35	Elizabeth, N.J.
Gordon, Robert Ransom, Jr.	Bus.,'34	Pittsburgh
Gortner, John William, Jr.	M.E.,'35	Shamokin
Gotthardt, Charles Jackson	Bus.,'36	Bayonne, N.J.
Gould, Henry Sanford	Arts,'34	Albany, N.Y.
Graef, Herman Frederick	Met.,'34	Stapleton, N.Y.
Graeff, William Harm	Ch.E.,'35	Hershey
Grafton, Herbert Sidney	Ch.E.,'34	Trenton, N.J.
Graham, Edward Clark	Bus.,'33	Newburgh, N.Y.
Grainger, Thomas Hutchison, Jr.	Eng.,'36	Allentown
Graw, Samuel Lazarus	Arts,'36	Newark, N.J.
Gray, Thomas Douglas Lloyd	Eng.,'36	Marlborough, N.Y.
Graziani, Orlando	Ch.E.,'33	Forli, Italy
Greason, Edwin Clarence	Bus.,'35	Newark, N.J.
Greene, Thomas Frederick	I.E.,'34	Easton

Greiner, Henry Sandt	Eng.,'36	Bethlehem
Grier, Garrett Layton	Bus.,'34	Milford, Del.
Grimwood, James Edward	Ch.E.,'35	Allentown
Groff, Frederick Augustus, Jr.	Arts,'35	Brooklyn, N.Y.
Grogan, George Davidson	Bus.,'35	Parkersburg, W.Va.
Gross, John Ellsworth	Bus.,'34	West Orange, N.J.
Grudin, Abraham	Arts,'33	Hillside, N.J.
Gruhn, Henry Otto	Bus.,'34	Brooklyn, N.Y.
Grzybowicz, Leon Alfred	Arts,'34	Nanticoke
Gum, Warren Speer	Eng.,'36	Pen Argyl
Gummere, William, Jr.	Ch.E.,'35	Trenton, N.J.
Guthrie, Edward Austin	E.E.,'35	Madison, N.J.
Guyer, Evan Henry	E.E.,'33	Buffalo, N.Y.
Guyer, Walter Richard	Eng.,'36	Allentown
Hackett, John Vincent	Bus.,'36	Riverton, N.J.
Hader, Michael	Arts,'35	Bethlehem
Haeseler, Leonard William	Eng.,'36	Reading
Hagstoz, George Swan	Chem.,'34	Riverton, N.J.
Halbreich, Gerald Joel	Arts,'34	Brooklyn, N.Y.
Hall, John Edwin	Chem.,'33	Bethlehem
Hallow, William Charles, Jr.	Arts,'36	Dunmore
Halperin, Benjamin	Arts,'34	Pittsfield, Mass.
Halsted, Charles Freeman, Jr.	Bus.,'33	Somerville, N.J.
Hammer, Fred Robert	Bus.,'34	New Haven, Conn.
Hanfield, DeWitt Clinton, Jr.	Eng.,'36	West Orange, N.J.
Hanna, Samuel James	Bus.,'34	Swarthmore
Hans, Alexander Amede	C.E.,'33	Locust Valley, N.Y.
Hanson, Elwood Whittier	Eng.,'36	Stamford, Conn.
Harding, William Cashmore	Met.,'35	East Orange, N.J.
Harleman, Samuel Thomas, Jr.	Bus.,'33	Bethlehem
Harris, William Thalheimer, Jr.	Bus.,'34	Allentown
Harrison, Clifford Earl, Jr.	Ch.E.,'33	Philadelphia
Harrower, Wilbur Parkhurst	Bus.,'34	Plainfield, N.J.
Hart, John Henry	Chem.,'33	Bethlehem
Hartman, Carl Robert	Bus.,'36	Lynnport
Hartmann, Theodore Frederick	Eng.,'36	Bethlehem
Hasler, Herman, Jr.	Bus.,'35	Caldwell, N.J.
Hauck, Elmer William	Eng.,'36	Englewood, N.J.
Haulenbeck, Garrie Beazley	Eng.,'36	Bound Brook, N.J.
Haupt, Harry Crickard, Jr.	Ch.E.,'34	York
Hawk, Frank Carkhuff, Jr.	M.E.,'35	Bound Brook, N.J.
Hayman, Richard Homer	Ch.E.,'35	Racine, O.
Haynes, Edward MacPherson, Jr.	Bus.,'35	Skillman, N.J.
Hazen, John Mercer	Met.,'33	Bethlehem
Healy, Dudley Loveland	Eng.,'36	Chatham, N.J.

Healy, Thomas Joseph	Eng.,'36	Bala-Cynwyd
Heath, Edwin Clifford	Eng.,'36	Bethlehem
Heether, Ernest Joseph	C.E.,'35	Williamsport
Heiberger, Charles Adams	Ch.E.,'35	Allentown
Heid, George Joseph, Jr.	Arts,'36	Freemansburg
Heiney, John Weitzel	Bus.,'35	Oxford
Heller, Edward Lincoln	E.M.,'35	Palmerton
Helms, Samuel Britton	Ch.E.,'35	Philadelphia
Hemphill, Wesley Lynn, II	Bus.,'35	Riverton, N.J.
Henderek, Frank Michael	Eng.,'36	Newark, N.J.
Hendey, Carl Nordell	Eng.,'36	Milford, Conn.
Hennessy, John Andrew, Jr.	Bus.,'36	Cherry Valley, Mass.
Hennings, Harold	Eng.,'36	Jersey City, N.J.
Henricks, Willis Mark	M.E.,'33	Pottstown
Henry, Eugene Howe	Bus.,'35	Ridgewood, N.J.
Hensinger, Carl Franklin	Arts,'36	Allentown
Herb, Probert Edwards	Arts,'33	Luzerne
Herbert, Sidney Pembroke	Eng.,'36	Upper Montclair, N.J.
Herrick, Robert Ford	Arts,'34	Youngstown, O.
Herron, Perry Marvin	Eng.,'36	New York, N.Y.
Hertel, Charles Clement, Jr.	M.E.,'34	Ridgewood, N.J.
Hertslet, Victor Beardsley	M.E.,'33	Rowayton, Conn.
Hertzog, Rudolph Henry	Met.,'33	Bethlehem
Hess, Francis Devereaux	Eng.,'36	Catasauqua
Hess, Richard Samuel	Bus.,'33	Bethlehem
Hickman, William DeForest	E.E.,'33	Arlington, N.J.
Hickok, Daniel Hastings	E.M.,'34	Harrisburg
Hildenberger, Martin Joseph, Jr.	Eng.,'36	Bethlehem
Hill, Harry Logan	C.E.,'35	Baltimore, Md.
Hillegas, Josiah Herman, Jr.	Bus.,'35	Forty Fort
Himsworth, Winston Edge	I.E.,'34	Flushing, N.Y.
Hinckley, Handy Samuel	Eng.,'36	Harrisburg
Hinckley, Willard Becker, Jr.	Bus.,'36	Bath
Hinkle, Harold Eugene	E.M.,'34	Bethlehem
Hirshberg, Harold	Bus.,'33	Long Beach, N.Y.
Hoar, Edgar Gordon	Bus.,'36	Ridgewood, N.J.
Hocker, Charles Richard	Eng.,'36	Bloomfield, N.J.
Hocking, John Girvin	Bus.,'36	Lancaster
Hodapp, Walter Leonard	Met.,'34	Maplewood, N.J.
Hoddinott, Wilbur Burton, Jr.	Arts,'36	Bethlehem
Hoffman, George Woodrow	Eng.,'36	Irvington, N.J.
Holcombe, William Bergen	Bus.,'34	Hopewell, N.J.
Holler, Henry Greve	Bus.,'34	Rockville Centre, N.Y.
Hollister, Charles Gurney	E.M.,'34	Trenton, N.J.
Hollister, Frank Joseph	E.E.,'35	Sea Cliff, N.Y.
Holme, Thomas Timings	M.E.,'35	Philadelphia
Holmes, Lawrence John, Jr.	I.E.,'34	Allentown
Holmes, William Eugene	Eng.,'36	Bethlehem
Holt, Reed Darlton	Bus.,'34	Pittsburgh

Holt, Robert Stewart	Bus., '35	Pittsburgh
Honeyman, Kenneth Louis	E.E., '34	Somerville, N.J.
Hopping, Richard Arundel	Arts, '35	Maplewood, N.J.
Hoppock, David Willard	Eng., '36	Maplewood, N.J.
Horlacher, George Appel	Ch.E., '35	Allentown
Horn, Woodrow Washington	Bus., '33	Bangor
Horowitz, Irving	Bus., '35	Brooklyn, N.Y.
Horowitz, Munroe	Arts, '34	New York, N.Y.
Hottenstein, John Mahlon	Eng., '36	Allentown
Houston, Allan Frederick	Eng., '36	River Forest, Ill.
Houston, James Homer	Bus., '34	West Grove
Howells, Edgar Harris	Met., '34	Johnstown
Howells, George Benjamin	Ch.E., '34	Hanover
Hower, Edwin Neiman	Met., '34	Lansdowne
Hoyt, Jack Garland	Eng., '36	Berwick
Hoyt, Stuart MacNee	Bus., '34	Pennington, N.J.
Hunt, David Joseph	Bus., '36	Grantwood, N.J.
Hurford, Winslow Leroy	Ch.E., '35	Neptune, N.J.
Hurley, Gilbert Melson	Eng., '36	New York, N.Y.
Hutchinson, William Seely, Jr.	Eng., '36	Bethlehem
Hutt, Milton Howard	C.E., '34	Egg Harbor City, N.J.
Hutton, Charles Wallace	Bus., '35	New Haven, Conn.
Hutton, Harold Lawton	Arts, '35	Pawtucket, R.I.
Huyck, James Horatio	Arts, '36	Dumont, N.J.
Hvass, Baldwin Charles	Bus., '36	New York, N.Y.
Isaly, Robert Lubbe	Bus., '36	Mansfield, O.
Issel, William Ernest	Bus., '34	Philadelphia
Ivins, Daniel Foster, Jr.	Bus., '35	Trenton, N.J.
Jackson, Charles Marcellus	Ch.E., '33	Philadelphia
Jackson, Robert Bickley	Bus., '35	Drexel Hill
Jackson, Walter William	Bus., '35	Ridgewood, N.J.
Jacobi, Walter Munhall	Bus., '34	Bayonne, N.J.
Jacobs, John Henry	Bus., '35	Hazleton
Jacobus, Walter Joseph	Arts, '36	Englewood, N.J.
James, Paul Meyer	Phys., '34	Reading
Jamison, Hugh Martin	Bus., '36	Greensburg
Jampol, Warren Sidney	Bus., '33	New Rochelle, N.Y.
Jasper, Richard Newton	Arts, '34	Mount Vernon, N.Y.
Jauck, Walter Milton	Eng., '36	Woodhaven, N.Y.
Jenny, Ernest Frederick	Ch.E., '33	Dumont, N.J.
Jerauld, Herbert Aaron	Arts, '33	Attleboro, Mass.
Jester, John Milton, Jr.	Ch.E., '35	Washington, D.C.
Johnson, Wallace Claybourne	Eng., '36	Southwick, Mass.
Johnson, William Austin	Met., '35	Washington, D.C.
Johnston, Drew Spamer	Arts, '34	Philadelphia
Jones, Cary Bodley	E.E., '33	Kirkwood, Mo.
Jones, Joseph William, Jr.	M.E., '35	Corning, N.Y.
Jones, Thomas Stran, Jr.	Ch.E., '35	Pittsburgh
Jordan, Thomas Benjamin	Bus., '34	South Orange, N.J.
Jurden, Wilbur Lawrence	M.E., '33	New York, N.Y.

Kaesemeyer, Charles Cassard	E.E.,'35	Hazleton
Kahn, Milton Walter	Chem.,'33	Stamford Conn.
Kain, Royal Christopher	I.E.,'34	Prince Bay, N.Y.
Kalb, George Herbert	Eng.,'36	Altoona
Kalisky, Leopold Mitchell	Arts,'35	Brooklyn, N.Y.
Kampshulte, Robert Henry	Ch.E.,'35	Farmingdale, N.Y.
Kaufman, Jack Henry	C.E.,'33	Wilmette, Ill.
Keck, Frederick Davidson	Bus.,'33	Pittsburgh
Keim, Charles, Jr.	M.E.,'35	Pottsville
Keller, Alfred William	Bus.,'34	Summit, N.J.
Keller, George Henry	M.E.,'33	York
Kelley, Walter Harvey, Jr.	Ch.E.,'33	Bethlehem
Kellstedt, Charles Ward	M.E.,'33	Flushing, N.Y.
Kellstedt, Paul Arthur	Arts,'36	Flushing, N.Y.
Kemmer, Robert Allison	Eng.,'36	Larchmont, N.Y.
Kennedy, Earl Frederick	Ch.E.,'34	Philadelphia
Kennedy, Frank Stewart	C.E.,'34	Llanerch
Kennedy, Henry Clay, Jr.	Eng.,'36	Harrisburg
Kerst, Orum Roehrer	Met.,'34	Jersey City, N.J.
Kichline, Thomas Peter	Eng.,'36	Bethlehem
Kight, John Wesley	I.E.,'34	New York, N.Y.
Kildare, Vernon Albert	Eng.,'36	Bethlehem
Kildebo, Howard Martin	M.E.,'35	Hazleton
Kilpatrick, Howard Frederick	Bus.,'34	South Orange, N.J.
King, Donald Milton	Eng.,'36	Bala-Cynwyd
Kinney, Arthur George, Jr.	Eng.,'36	Janison
Kinsinger, Walter Willis	E.E.,'34	Harrisburg
Kipper, Norman	Eng.,'36	Jersey City, N.J.
Kirchman, Carl Edward	Bus.,'35	Allentown
Kistler, Wilson Stephen	Bus.,'33	Stroudsburg
Klatskin, Charles	Bus.,'34	Johnstown
Klausmann, Milton Harry	I.E.,'35	Maplewood, N.J.
Klein, Charles Anthony	Arts,'34	Allentown
Kleinman, Isaac Ernest	Arts,'34	Newark, N.J.
Kleppinger, Clayton Thomas	Eng.,'36	Allentown
Knauss, Albert Roland	Eng.,'36	Nazareth
Knipe, Robert Krauss	M.E.,'33	Philadelphia
Knipe, Vincent Arthur	Arts,'35	Bethlehem
Kohler, Stanley Maurice	Eng.,'36	Bloomfield, N.J.
Kolyer, Franklin Adee	Bus.,'33	Summit, N.J.
Koman, Mike	Ch.E.,'35	Fogelsville
Konolige, George Charles, Jr.	Bus.,'34	Bethlehem
Koondel, Jack William	Bus.,'34	Brooklyn, N.Y.
Koranye, Theodore Desiderius	Phys.,'35	Babylon, N.Y.
Korn, Willard Charles	Bus.,'34	Irvington, N.J.
Kornet, John Leonard	Eng.,'36	Wortendyke, N.J.
Kornfield, Norman Bernard	Arts,'35	Verona, N.J.
Kotanchik, Nicholas Walter	E.M.,'34	Ranshow
Kozak, Walter Harry	Eng.,'36	Shamokin
Kraemer, John Jacob	Eng.,'36	Miami Beach, Fla.

Krasner, Sanford	Bus.,'35	Newark, N.J.
Kremer, Erich Conrad Gustav	Bus.,'34	Paterson, N.J.
Kresge, Warren Hillory	Bus.,'33	Bethlehem
Kress, Jackson Edmund	Arts,'35	Pen Argyl
Kress, John Harner	Eng.,'36	Pittsburgh
Kring, Carroll Sylvester	Eng.,'36	Reading
Krisher, William Stanley	Bus.,'35	Philadelphia
Krusius, Ewald Henry	Ch.E.,'35	Weehawken, N.J.
Kugler, Robert Green	C.E.,'33	East Orange, N.J.
Kuhl, Frederick August	Eng.,'36	Allentown
Kuhl, William Frederick, Jr.	Bus.,'36	Allentown
Kuhns, Charles Henry	Arts,'36	Allentown
Kulp, Samuel Randall	Chem.,'33	Bethlehem
Kurtz, Milton David	Bus.,'36	Trenton, N.J.
Laftman, Rickard Nicholas	M.E.,'33	Bayonne, N.J.
Lake, Leonard Michael	Bus.,'36	Mount Vernon, N.Y.
Lambert, Fred	Bus.,'34	Maplewood, N.J.
Lanahan Ellwood Royal	E.E.,'33	Philadelphia
Land, Edward Herbert	Arts,'36	Brooklyn, N.Y.
Landis, Given Arnold	Met.,'34	Bethlehem
Landis, Robert Prince	M.E.,'33	Old Greenwich, Conn.
Lane, John Wilson	Eng.,'36	Newton, N.J.
Langdon, Palmer Hull, Jr.	Eng.,'36	Brooklyn, N.Y.
Langer, Henry Charles, Jr.	Arts,'36	Hasbrouck Heights, N.J.
Langhaar, John Williamson	I.E.,'33	Allentown
Lannan, Louis Edgar, Jr.	Eng.,'36	McKeesport
Laporta, Xavier Vincent	Chem.,'34	Weedville
Larbig, Walter Arthur	Eng.,'36	Maplewood, N.J.
Lark, Frederick Emanuel	Arts,'35	Shamokin
Larsen, Arnold Leo	Bus.,'34	South Orange, N.J.
Larson, Andrew Justus	Met.,'34	Lynden, Wash.
Laschober, Eugene William, Jr.	Met.,'33	Belvidere, N.J.
Lathrop, William Romeyn,	Bus.,'33	Birmingham, Ala.
Lauer, Franklin Richard	Bus.,'36	Lansford
Lawlar, John Bovaird	Ch.E.,'35	Chester
Lawton, Irving Lester	Bus.,'36	Olcott, N.Y.
Layman, Ralph Earl, Jr.	Ch.E.,'35	New York, N.Y.
Layton, Daniel John	Arts,'33	Georgetown, Del.
Leach, Orin Tuck	Bus.,'34	Red Bank, N.J.
Lee, Robert Peary	E.E.,'33	Meriden, Conn.
Legge, Edwin Thomas	Met.,'33	Bound Brook, N.J.
Lehr, Charles Frederick	E.M.,'33	Stockertown
Leibowitz, Sol David	Arts,'33	Long Branch, N.J.
Lengel, Robert Charles	Met.,'34	Bryn Mawr
Lenna, Reginald Alexander	Eng.,'36	Jamestown, N.Y.
Lentz, John Bethke	Eng.,'36	Collegeville
Levin, Lawrence William	Bus.,'34	Port Jarvis, N.Y.
Levinson, Sidney David	Arts,'33	Bradley Beach, N.J.

Levy, Murrel	Eng.,'36	Scranton
Levy, Sylvan Newton, Jr.	Eng.,'36	Arden, Del.
Lewis, Jerome Philip	Arts,'33	East Orange, N.J.
Lewis, Monroe Samuel	Arts,'33	Newark, N.J.
Liggett, Frank Rahm, Jr.	Arts,'35	Bethlehem
Liggett, Thomas, III	Ch.E.,'34	Jenkintown
Lillie, Robert Whitfield	Ch.E.,'35	Newark, N.J.
Lincoln, Edwin Marsden	Bus.,'36	New Haven, Conn.
Lindabury, Richard Nicholas	Chem.,'34	Burlington, N.J.
Lindenhayn, Rolf, Jr.	Eng.,'36	Ridgewood, N.J.
Linguiti, Albert Filbert	Bus.,'33	Brooklyn, N.Y.
Link, Gordon Peter	Eng.,'36	Schenectady, N.Y.
Linton, Thomas	E.M.,'34	Palmer
Lippard, Robert Frost	I.E.,'35	Buffalo, N.Y.
Lipsky, Alfred Joseph	Bus.,'33	Troy, N.Y.
Lisle, John	Ch.E.,'35	Paoli
List, Alexander Frederick	Bus.,'35	Maplewood, N.J.
Lloyd, Elbert Stevens	Bus.,'35	Wilkes-Barre
Lloyd, John Armon	M.E.,'33	Wilkes-Barre
Lloyd, Nicholas Peregrine, Jr.	Bus.,'33	Philadelphia
Lodge, Richard Aspril	M.E.,'33	Philadelphia
Lohmeyer, Robert Henry	Bus.,'36	Baltimore, Md.
Lohse, John Mueller	Phys.,'33	Glen Ridge, N.J.
London, Russell Isaiah	Arts,'35	Philadelphia
Long, Austin Kunsman	Ch.E.,'34	Freemansburg
Lore, Henry Edgar	M.E.,'35	Atlantic City, N.J.
Lorenzo, Manuel DePerez	Arts,'36	Bethlehem
Lotz, William Frederick, Jr.	Eng.,'36	Philadelphia
Loughran, Patrick Henry	C.E.,'34	Washington, D.C.
Loux, Arthur Henry	Bus.,'36	Newark, N.J.
Lovett, Albert Burbank	Eng.,'36	East Orange, N.J.
Lowright, Raymond Charles	Bus.,'36	Bethlehem
Lubbers, Adolph William	E.E.,'34	Baltimore, Md.
Lueders, Charles Williamson	Met.,'35	Bala-Cynwyd
Lundgren, William John	Bus.,'36	Frederick, Md.
Lutz, Curwen William	Ch.E.,'35	Perkasie
Lutzy, Robert Henry	Bus.,'33	Cleveland, O.
Macdonald, William Henry, Jr.	I.E.,'35	Passaic, N.J.
MacGuffie, James	Ch.E.,'34	West Orange, N.J.
MacLetchie, John Graham	Bus.,'36	Old Greenwich, Conn.
MacPhee, Joseph Hugh	Bus.,'35	Arlington, Mass.
Maguire, Kenneth Faust	Arts,'35	Mahanoy City
Mahan, Frank Harvey, Jr.	Bus.,'36	Haverford
Male, John Medland	Eng.,'36	Brooklyn, N.Y.
Malinowski, Francis Xavier	I.E.,'35	Harrisburg
Mallalieu, Frank Rodeback,		
Jr.	Eng.,'36	Oxford
Mancke, Edgar Bell	Eng.,'36	Bethlehem
Manheimer, Sanford Hirsch	Eng.,'36	Lancaster
Manookian, Edward Aram	Arts,'36	New York, N.Y.

Manos, Teddy Michael	I.E.,'35	Greensburg
Manson, George Douglas	Bus.,'35	Red Bank, N.J.
Mant, Robert Warnock	Bus.,'35	Arlington, N.J.
Mapes, Charles Maynard, Jr.	Bus.,'36	Rutherford, N.J.
Maratta, William Zimmerly	E.M.,'36	Coraopolis
Marks, Bennett Joseph	Arts,'36	Brooklyn, N.Y.
Marks, Robert Edwin	Ch.E.,'35	Allentown
Marshall, Erwin Ellsworth, Jr.	Arts,'35	Trenton, N.J.
Marshall, William Don	Eng.,'36	Camden, N.J.
Martin, Harry Charles Cookley	Ch.E.,'34	Glen Rock, N.J.
Martin, William Stockton, Jr.	Eng.,'36	Stratford, N.J.
Martinson, Richard Ottocar	Bus.,'35	Newton, N.J.
Masiko, Peter, Jr.	Arts,'36	Allentown
Matesky, Solomon Joseph	Ch.E.,'34	Bethlehem
Mathers, Joseph Willis	Eng.,'36	Brookline
Mathews, George Eugene, Jr.	Chem.,'33	Norwalk, Conn.
Mathews, John White	Eng.,'36	Wilmington, Del.
Matthews, John Hanson	Bus.,'35	Newark, N.J.
Mayer, Victor	Arts,'34	Brooklyn, N.Y.
Maynard, William Benz	I.E.,'35	Paterson, N.J.
Mayshark, James Page	Eng.,'36	Chatham, N.J.
McArdle, John James	Arts,'35	Habana, Cuba.
McBane, Alan Hubert	E.M.,'34	Aliquippa
McCaa, William Donald	Arts,'36	Bethlehem
McCabe, Joseph Charles	Eng.,'36	Plainfield, N.J.
McClintic, Richard Ridge	C.E.,'35	Pittsburgh
McComb, John Russell	Arts,'36	Rockville Centre, N.Y.
McConachie, Raymond James	Bus.,'36	Belleville, N.J.
McConahey, Hugh Milner	M.E.,'34	Wilkinsburg
McConnell, John Henry	Met.,'34	Youngstown, O.
McCormick, Gordon	Bus.,'36	Buffalo, N.Y.
McDaniel, Joseph Stites	Bus.,'34	Dover, Del.
McDowell Henry Woodward	Bus.,'34	Maplewood, N.J.
McElwain, John Stanley	Bus.,'33	Sewickley
McGinley, Edward Eugene	Met.,'34	Allentown
McGovern, John Joseph	Ch.E.,'33	Bethlehem
McIlwraith, Arthur Kenneth	Arts,'34	Ridgewood, N.J.
McKechnie, Edward	E.M.,'33	Denver, Col.
McKeone, Charles Joseph	Bus.,'36	Allentown
McLeod, Richard Earl	I.E.,'34	Rutherford, N.J.
McMeans, George Beale	Met.,'35	Tarentum
McNally, Hubert Arthur, Jr.	Bus.,'36	New York, N.Y.
Meihofer, Anthony Rudolph	Eng.,'36	Allentown
Meisel, Stanley	Bus.,'35	Newark, N.J.
Meissner, Milton	Ch.E.,'34	Plainfield, N.J.
Meixell, Milo Daniel	C.E.,'34	Nazareth
Merriam, William Rush	Arts,'34	Washington, D.C.

Merritt, George Jester	Ch.E.,'34	Wilmington, Del.
Mertens, Fred Meharg	M.E.,'34	Asbury Park, N.J.
Messmore, Isaac Lindsey	Arts,'36	Masontown
Metz, Elwood Cawley	C.E.,'34	Nazareth
Metz, Ralph Ziegler	Bus.,'35	Nazareth
Meyer, Albert Henry	Eng.,'36	Jersey City, N.J.
Michaelson, Stanley Day	E.M.,'34	Brooklyn, N.Y.
Middleton, Arthur Pierce, Jr.	Arts,'36	Mount Vernon, N.Y.
Miller, Clinton Fred	Chem.,'34	Berwick
Miller, Edgar Gilpin	Arts,'35	Easton
Miller, Frank Bott, Jr.	Eng.,'36	Greensburg
Miller, Harold Yack	Ch.E.,'34	Lyndhurst, N.J.
Miller, Henry Nathan	Arts,'33	Bethlehem
Miller, John Edwin	Bus.,'33	Bethlehem
Miller, Marlin Charles	Eng.,'36	Donaldson
Miller, Seymour	Arts,'34	Brooklyn, N.Y.
Miller, Walter Samuel	Ch.E.,'34	California
Milliken, Thomas Henry, Jr.	Ch.E.,'35	Pittsburgh
Mills, Ivor William	Eng.,'36	Wyoming
Mills, William Wirt	Bus.,'34	Staten Island, N.Y.
Minifie, Benjamin	Arts,'33	Belleville, N.J.
Minnich, Charles Franklin	Eng.,'36	West Lawn
Minskoff, Henry Harold	Bus.,'34	New York, N.Y.
Minskoff, Jerome	Bus.,'36	New York, N.Y.
Mintz, Gerald Emanuel	E.E.,'34	Allentown
Mitchell, Grable Harry	Bus.,'33	Washington, D.C.
Mock, Frank Day	Bus.,'36	Montclair, N.J.
Moffett, Marvin Charles	Arts,'33	Coatesville
Moffett, Robert Nelson	C.E.,'34	Coatesville
Mollenauer, William Emery	I.E.,'35	Canonsburg
Mommers, Theodor Wallace	I.E.,'33	Baltimore, Md.
Moore, Charles Atwell	Eng.,'36	Scarsdale, N.Y.
Moore, Francis Raymond	Bus.,'35	St. Clair, Mich.
Moore, Robert Hawkesworth	Bus.,'36	Pleasantville, N.Y.
Moorhead, Herman Alexander	Met.,'34	Cleveland Heights, O.
Moran, William Thomas, II	Eng.,'36	White Plains, N.Y.
Morgan, Charles Edmund, Jr.	Met.,'34	Old Greenwich, Conn.
Morgan, Frank Benedict	E.E.,'35	Dunmore
Morgan, Robert Vincent	Bus.,'33	Bethlehem
Morris, Arnold	Arts,'36	Brooklyn, N.Y.
Morris, Henry Sanford, II	Ch.E.,'35	Woodbury, N.J.
Morrison, Arthur Victor	Eng.,'36	Ridgefield Park, N.J.
Morrison, George Ronald	Eng.,'36	Minersville
Morse, John Alfred	Ch.E.,'34	Scranton
Moyer, Charles C., Jr.	Eng.,'36	Allentown
Mozes, Adolph	I.E.,'34	Allentown
Muir, Malcolm Stabler	Arts,'35	Williamsport
Munzer, Maurice Herbert	Arts,'33	New York, N.Y.
Musselman, Casper Rosen-		
stock	Eng.,'36	Bethlehem

Musser, Shelton Arthur	C.E.,'35	Reading
Myers, Benjamin Herman	Bus.,'34	Salem, Mass.
Myers, Philip Luther	Bus.,'35	Spring Grove
Myers, Robert Julius	Phys.,'33	Elkins Park
Nead, Benjamin Matthias	Arts,'35	Harrisburg
Neely, John DeMont	Arts,'35	Latrobe
Neiman, Charles Herman	M.E.,'35	York
Neiman, Paul Ebler	Eng.,'36	Philadelphia
Neiman, William Robert	Bus.,'36	Philadelphia
Nelson, Arthur Ferdinand, Jr.	I.E.,'34	Harrisburg
Newcomb, Thomas Warwick	C.E.,'33	Long Branch, N.J.
Newman, Samuel Joseph	Bus.,'33	Nutley, N.J.
Nichols, Edson Hoyt, Jr.	Eng.,'36	Hackensack, N.J.
Nichols, John Perry	I.E.,'33	Pennington, N.J.
Nickerson, Philip Gurney	I.E.,'34	Pittsburgh
Niehaus, Raymond Martin	I.E.,'33	East Orange, N.J.
Nielsen, Axel Tage, Jr.	Ch.E.,'33	Elizabeth, N.J.
Nilan, John Joseph, Jr.	C.E.,'35	Bergenfield, N.J.
Nisbet, Robert Alexander	I.E.,'33	Pittsburgh
Nissley, Samuel Brandt	M.E.,'35	Salunga
Nivin, David Traver	Ch.E.,'34	Bethlehem
Noecker, Therman Clifford	E.E.,'34	Shoemakersville
Nolfi, Emil Leo	E.M.,'34	Glen Lyon
Nordt, William Faust	Eng.,'36	Newark, N.J.
Norton, Nathaniel	Bus.,'36	Greenwich, Conn.
Nufer, Edward Charles	Bus.,'36	Weehawken, N.J.
Nutt, Walter Frederick, Jr.	Eng.,'36	Clifton, N.J.
O'Brien, Harry Joseph, Jr.	Bus.,'34	Deal, N.J.
O'Brien, Robert Lee, Jr.	Bus.,'33	Washington, D.C.
Ock, Harold David	Bus.,'36	Brooklyn, N.Y.
Ohmer, Paul Herman	Eng.,'36	Ridgewood, N.J.
Okuno, Clifford Kaiei	Chem.,'34	Delaware Water Gap
Olney, Richard Holden	Bus.,'33	Lowell, Mass.
Olfson, Carl Theodore	Ch.E.,'35	West Orange, N.J.
Olfson, Earl Clifford	M.E.,'35	West Orange, N.J.
Olwine, Richard Eyrich	Bus.,'34	Perth Amboy, N.J.
Opie, John Vredenberg	Ch.E.,'35	Neshanic, N.J.
Oskin, William Walker	Eng.,'36	Bethlehem
Osman, Albert Edward	Phys.,'35	Bridgeport, Conn.
Osterhoudt, Lawrence Jan	Eng.,'36	New Paltz, N.Y.
Osterstock, Louis Henry	Bus.,'35	Irvington, N.J.
Pangburn, Robert Arthur	Phys.,'34	Oneonta, N.Y.
Parassio, Anthony Vincent	M.E.,'35	Camden, N.J.
Parrish, Frank Collins	Bus.,'36	Ridgewood, N.J.
Parsons, Herbert Heltz- heimer, Jr.	Eng.,'36	Palmyra, N.J.
Parsons, John Leonard	Bus.,'34	Troy
Parthemore, Philip Mark, Jr.	Bus.,'36	Harrisburg
Partridge, Seymour Truman	M.E.,'34	Northville, N.Y.
Patella, Armand Major	Arts,'36	Brooklyn, N.Y.

Paternoster, Joseph Albert, Jr.	C.E.,'35	Trenton, N.J.
Paterson, Gordon Wilson	Bus.,'34	Arlington, N.J.
Patten, Alex Stevens	Ch.E.,'35	Ridgewood, N.J.
Paul, David Hunt	Arts,'36	Langhorne
Paul, Herman Louis, Jr.	Eng.,'36	New Rochelle, N.Y.
Payne, Bruce McCollum	Arts,'35	Montrose
Pazzetti, Vincent Joseph, III	Eng.,'36	Bethlehem
Pearson, Philip Dawson	Eng.,'36	Wilkes-Barre
Pease, Robert Horton	Bus.,'35	Rochester, N.Y.
Peck, Clarence Bardwell, Jr.	Bus.,'33	Charleston, W.Va.
Peck, Marcel Kahle	Bus.,'35	Charleston, W.Va.
Pedrick, George James	Arts,'34	Cold Spring Harbor, N.Y.
Pelizzoni, Winton John	M.E.,'34	Allentown
Pencek, Ronald Frederick	Arts,'36	Scranton
Pennington, Fred Alexander	Eng.,'36	Montoursville
Pennington, Robert Janvier	Arts,'35	Trenton, N.J.
Pentz, Harold Henry	E.M.,'33	Bethlehem
Peraino, Joseph John	Eng.,'36	Ridgewood, N.J.
Perrine, Robert Hutchinson	Eng.,'36	Bloomfield, N.J.
Peters, Carl Brooks	Arts,'34	New York, N.Y.
Peterson, Walter Albert	Bus.,'34	Summit, N.J.
Pfaff, Henry Carl, Jr.	Ch.E.,'35	East Orange, N.J.
Pharo, Charles Budd, Jr.	E.E.,'35	Trenton, N.J.
Phillips, Andrew Nesbitt	Bus.,'36	Morristown, N.J.
Phillips, Robert Roth	Met.,'33	Pittsburgh
Pickell, Clement Charles	M.E.,'35	Flushing, N.Y.
Picking, Robert Boyd	Eng.,'36	Somerset
Pierce, Donald Charles	Bus.,'33	Paterson, N.J.
Pierson, Frank Kenneth	Eng.,'36	Washington, D.C.
Pinkus, Herman Charles	Ch.E.,'35	Olyphant
Piper, John Arthur	Arts,'35	South Orange, N.J.
Pisarev, David	Ch.E.,'34	Bethlehem
Pitcairn, Alexander	Bus.,'35	Pittsburgh
Pittenger, Frank Mott	Bus.,'34	Bethlehem
Plumb, Walter Timms	Bus.,'34	Elizabeth, N.J.
Poggi, Edmund Howe, Jr.	I.E.,'33	Wilkes-Barre
Polk, Cletus Vincent	Arts,'36	Port Washington, N.Y.
Porter, Robert Shelly	E.E.,'34	East Northfield, Mass.
Porzig, Charles Frederick	Bus.,'36	Newark, N.J.
Potter, Charles Beattie	Arts,'36	Washington, D.C.
Potter, William Townley	Bus.,'33	Elizabeth, N.J.
Powell, George Farabaugh	Bus.,'36	Altoona
Prall, Robert Claude	Arts,'35	Brooklyn, N.Y.
Pratt, Raymond Morrison	Arts,'35	York
Pratt, Thomas Willard	Ch.E.,'35	Jersey City, N.J.
Preston, Paul Franklin	Ch.E.,'35	Bethlehem
Price, Henry Embleton	Arts,'34	Sayre
Prior, Joseph Eli	Met.,'35	Bayonne, N.J.

Prosnit, Daniel Robert	Bus.,'36	New York, N.Y.
Provost, Richard Whitehead	Eng.,'36	Caldwell, N.J.
Powell, Roy Walters	Eng.,'36	Steelton
Puffer, Hal Everest, Jr.	Bus.,'36	Buffalo, N.Y.
Purdy, George William	Bus.,'34	Englewood, N.J.
Purnell, Forest Clarence James	C.E.,'35	Pottstown
Putnam, Kent Sayre	Arts,'35	Bethlehem
Quackenbush, Cornelius Bogaert	Eng.,'36	Hackensack, N.J.
Quinn, Joseph Aloysius	E.E.,'34	Pittston
Quinn, Thomas Stephen	Arts,'36	Bethlehem
Rachlin, Albert Cyrus	Arts,'35	Mount Vernon, N.Y.
Radding, Jason David	Arts,'35	Larchmont, N.Y.
Rader, Milton James	E.E.,'34	Easton
Rae, Morton Black	Bus.,'35	West Newton, Mass.
Ralston, Donald Mackenzie	Eng.,'36	Mount Vernon, N.Y.
Ramsay, Robert Cooper	Eng.,'36	Reading
Rand, Vandervoort	Bus.,'35	North Tonawanda, N.Y.
Raring, Linus Michael	Met.,'34	Harrisburg
Raring, Richard Holland	Eng.,'36	Harrisburg
Rau, William Jamison	Eng.,'36	Bethlehem
Rawn, Andrew Bryson, Jr.	I.E.,'34	Huntington, W.Va.
Reabuck, Roy Arthur	Arts,'34	Forty Fort
Redline, Harold Samuel	E.E.,'35	Bethlehem
Reed, George Douglas	I.E.,'33	Baltimore, Md.
Reed, Martin Monroe, Jr.	Arts,'33	Philadelphia
Reidy, Hamil	Bus.,'35	New York, N.Y.
Reis, Robert	Arts,'36	New York, N.Y.
Renard, Walter Ashton	Eng.,'36	Great Neck, N.Y.
Retzer, William Raymond	Ch.E.,'34	Deposit, N.Y.
Reul, Raymond Insel	Ch.E.,'35	Roselle, N.J.
Reynolds, Vincent William	Bus.,'35	Balboa, Canal Zone
Rhoades, William Taylor	Bus.,'33	Washington, D.C.
Rhoads, James Crisman	M.E.,'33	Harrisburg
Ricards, Atwood Jester	Ch.E.,'33	Marshallton, Del.
Rich, Adin Partridge, Jr.	Eng.,'36	Buffalo, N.Y.
Richardson, Franklin William	Eng.,'36	Flushing, N.Y.
Richter, Frederick Kingdon	I.E.,'34	Selinsgrove
Rick, Richard	Eng.,'36	Reading
Ridge, William Francis, Jr.	E.E.,'34	Tamaqua
Rife, Charles Jacob	E.E.,'35	Lemoyne
Rights, Fred Lewis	Ch.E.,'33	Bethlehem
Rigling, Vance Fager	E.E.,'33	New Cumberland
Riley, Reginald LaDow	Bus.,'35	Port Norris, N.J.
Riley, Robert Hickman, Jr.	E.E.,'35	Catonsville, Md.
Riley, Robert Leinbach	I.E.,'34	Woodcliff, N.J.
Rimmer, Donald Cyril	Eng.,'36	Philadelphia
Riss, Gustav Anton	Eng.,'36	Cleveland, O.
Ritter, Ernest Frederick, Jr.	Arts,'34	Allentown

Ritter, Ferman Thomas	E.E.,'35	Easton
Riviere, Burt Henry	Bus.,'33	Pittsburgh
Rizzardi, Angustus Charles	Eng.,'36	Orwigsburg
Robar, Henry John	Met.,'33	Bethlehem
Robb, Alexander Duffield, Jr.	Bus.,'33	Grand Island, N.Y.
Robb, Edward Haupt	Bus.,'33	Grand Island, N.Y.
Robbins, Leonard Edmund	Arts,'35	Millville, N.J.
Roberts, Frank Stuart	Arts,'35	Wilkes-Barre
Roberts, John Douglas	Eng.,'36	Sharon Hill
Roberts, Lewis, Jr.	Bus.,'36	Fairfield, Conn.
Roberts, Paul Taylor	Eng.,'36	Westfield, N.J.
Robinson, Neil	Arts,'36	New York, N.Y.
Robinson, William Allan	C.E.,'34	Chestertown, Md.
Rodgers, Jay Tongate	Bus.,'36	South Orange, N.J.
Roeber, William Henry	Arts,'34	Irvington, N.J.
Roessle, James Jackson	Arts,'33	Pittsburgh
Rogers, Gilbert Dwight	Eng.,'36	Big Stone Gap, Va.
Rogers, Wayne Carlton	Eng.,'36	Kingston
Rohrer, Frederick Findlay, Jr.	I.E.,'34	Wilkinsburg
Root, Benjamin Mylin	I.E.,'35	York
Roper, Charles Garland	Phys.,'35	Petersburg, Va.
Roper, John Nathaniel, Jr.	Ch.E.,'34	Petersburg, Va.
Rorty, Philip Adams	Bus.,'34	Goshen, N.Y.
Rosebery, Hugh John	Eng.,'36	West Haven, Conn.
Rosenheim, Morton Adolph	Arts,'35	Brooklyn, N.Y.
Roth, William Franklyn	Arts,'36	Coopersburg
Rothenberg, Nathaniel Shomer	Arts,'33	New York, N.Y.
Rouse, Richard Huber	Ch.E.,'33	Camp Hill
Rowe, Robert Edward	Arts,'35	Catonsville, Md.
Rowland, Lindsay	Arts,'34	Freeland
Rozell, Albert Fellows	Eng.,'36	Croton-on-Hudson, N.Y.
Ruch, Richard Karl	Chem.,'33	Allentown
Ruffer, Harry Herman	Bus.,'33	Westfield, N.J.
Ruffle, Leslie	Eng.,'36	Queens Village, N.Y.
Russell, George Burton	Eng.,'36	East Hampton, N.Y.
Russell, Howard Ewing	Bus.,'36	Plainfield, N.J.
Russo, Rudolph Louis	Arts,'34	Brooklyn, N.Y.
Rust, Stirling Murray, Jr.	M.E.,'34	Pittsburgh
Rust, William Fitzhugh, Jr.	Eng.,'36	Pittsburgh
Ruth, George Clifford	Bus.,'34	Maplewood, N.J.
Ryan, James Kenneth	Bus.,'33	Schenectady, N.Y.
Sadtler, Philip	Chem.,'34	Philadelphia
Salkin, Robert Edward	Arts,'36	New Rochelle, N.Y.
Salmon, Robert Macdonald	Bus.,'35	Maplewood, N.J.
Samuels, David Griffith, Jr.	Eng.,'36	Bethlehem
Sandercock, Charles Hulbert	Arts,'35	Scranton
Sandwick, Charles Martin	Arts,'34	Elmira Heights, N.Y.
Sasse, Ralph Warren	Bus.,'36	New York, N.Y.
Savage, Walter Benjamin	Bus.,'36	West Cape May, N.J.

Savastio, James Dominic	Eng.,'36	Hershey
Sawyer, Edwin Albert	Bus.,'35	Bethlehem
Sawyer, John Sherman	C.E.,'33	Bethlehem
Saxman, John Brooke	Bus.,'36	Somerset
Saxtan, George Taylor	Bus.,'36	Jersey City, N.J.
Sayer, William Hallock, Jr.	Eng.,'36	Warwick, N.Y.
Schaeffer, Judson	Arts,'36	Bethlehem
Schaffer, Elwood Joseph	Ch.E.,'34	Bath
Schal, George Richardson	Bus.,'35	Oradell, N.J.
Schappel, Joseph William	Ch.E.,'35	Allentown
Scharfenberg, Chatwin Ambrose	M.E.,'33	East Rockaway, N.Y.
Schatz, Robert James	Eng.,'36	Allentown
Schaub, Charles Emmet	Arts,'34	Freeland
Scheer, Henry Conrad, Jr.	I.E.,'33	Glen Ridge, N.J.
Scheid, William Franklin, Jr.	Bus.,'36	Lancaster
Schellenberg, Edward John, Jr.	Eng.,'36	Englewood, N.J.
Schenk, Everett Milford	Eng.,'36	Summit, N.J.
Scher, Jerome Norman	Bus.,'36	Newark, N.J.
Schilling, Frank David	Arts,'34	Philadelphia
Schleid, John Theodore	Bus.,'35	Bellevue
Schlenker, Henry Walter, Jr.	Eng.,'36	Elizabeth, N.J.
Schmidt, James	Eng.,'36	Wilkes-Barre
Schmidt, John George	Eng.,'36	York
Schmoyer, Frederick Peter	Eng.,'36	Allentown
Schneck, Karl Roy	Arts,'33	Allentown
Schneider, Frederick Cortlandt, Jr.	E.M.,'35	New Haven, Conn.
Scholl, Harold Nevin	Ch.E.,'34	Souderton
Scholla, Paul Frederick	E.M.,'35	Dunmore
Schreiber, William	Arts,'35	Asbury Park, N.J.
Schuylar, Elmer Van Ness	I.E.,'33	Upper Darby
Schwartz, Robert Wilmot	Arts,'36	Harrisburg
Schwartz, Sanford	Bus.,'33	New York, N.Y.
Schwarz, Sidney May	Bus.,'35	Dover, N.J.
Schwarzwaelder, LeRoy	Eng.,'36	Maplewood, N.J.
Scobey, Howell Alexander, Jr.	Eng.,'36	Neptune City, N.J.
Scopinich, Robert Mark	Bus.,'36	Demarest, N.J.
Searle, William Baum	Eng.,'36	Carbondale
Seeley, Howard Wilson, Jr.	C.E.,'35	Woodcliff, N.J.
Seiler, Edwin William	E.M.,'33	Maplewood, N.J.
Serfass, Earl James	Ch.E.,'33	Allentown
Settle, Paul Smith, Jr.	Eng.,'36	Drexel Hill
Seybold, Arthur Mack	Eng.,'36	Elkins Park
Shackford, Charles Chauncey	E.E.,'35	Jamestown, R.I.
Shafer, David Woodrow	I.E.,'35	Bethlehem
Shafer, Montgomery Rea, Jr.	Eng.,'36	Chevy Chase, Md.
Sharpe, Fred Lawrence	Eng.,'36	Ridgefield Park, N.J.
Shawin, Irving	Arts,'36	Allentown

Shelhart, John William	I.E.,'33	Euclid, O.
Shepard, Harvey Mortimer	Eng.,'36	Madison, N.J.
Sherrill, Clarence Caldwell	Bus.,'35	Cincinnati, O.
Shimer, Acton Jerome	E.E.,'35	Bethlehem
Shipley, David Gregg	Arts,'33	Hoboken, N.J.
Shipp, Harry Benedict	C.E.,'35	Bethlehem
Short, Paul Edward	Bus.,'34	Belleville, N.J.
Siegel, Henry Amerbuch	Bus.,'36	New York, N.Y.
Siegel, Kenneth Cottrell	Eng.,'36	New York, N.Y.
Siegel, William George	Arts,'36	New York, N.Y.
Silimperi, Pasquale	Ch.E.,'34	Bethlehem
Silver, Harold Irving	Bus.,'34	Hudson, N.Y.
Silverberg, Nathan	Arts,'35	Bethlehem
Silverstein, Harold	Arts,'34	Philadelphia
Silverstein, Milton	Bus.,'33	Brooklyn, N.Y.
Simcoe, William Henry	C.E.,'33	Trenton, N.J.
Simmons, Samuel John, Jr.	Bus.,'34	Scarsdale, N.Y.
Sims, Ivor Donald	Bus.,'33	Bethlehem
Sine, Aubrey Bernard, Jr.	Bus.,'35	Trenton, N.J.
Singer, Philip Gedge	Eng.,'36	Peoria, Ill.
Sitterly, Theodore Synder	I.E.,'35	Bronxville, N.Y.
Sittler, Paul Mertz	I.E.,'34	Kutztown
Skedgell, Ralph Erving	Bus.,'36	Millville, N.J.
Skelly, John Scott, Jr.	Ch.E.,'33	Monongahela
Slater, Ralph Ellsworth	Eng.,'36	Newton, N.J.
Slaughter, Page Harrison, Jr.	Bus.,'33	East Aurora, N.Y.
Slingerland, Edward Gilmore	Bus.,'34	Millburn, N.J.
Sloan, Robert Otis	Eng.,'36	Pomona, Cal.
Slonaker, Ralph E.	Arts,'35	Nazareth
Smith, Arnold Richard	Ch.E.,'35	Albany, N.Y.
Smith, Bradford Kimball	Arts,'35	Maplewood, N.J.
Smith, Charles Richardson	Eng.,'36	Kew Gardens, N.Y.
Smith, Charles Sproat	Bus.,'35	Swarthmore
Smith, Edward David	Eng.,'36	Easton
Smith, Elmer Francis, Jr.	Ch.E.,'35	Roselle Park, N.J.
Smith, Francis John	Arts,'34	Ballston Spa, N.Y.
Smith, Frank Garretson, Jr.	Bus.,'36	Upper Montclair, N.J.
Smith, George Ellery Reeve	Bus.,'35	Mineola, N.Y.
Smith, Gerard Leonard	I.E.,'35	Scranton
Smith, Irwin Curtiss	I.E.,'35	Mineola, N.Y.
Smith, Stanton McMasters	Eng.,'36	Montclair, N.J.
Smith, William Moffett, Jr.	Eng.,'36	Freehold, N.J.
Smull, Judson Gray, Jr.	Arts,'36	Bethlehem
Snavely, Frank Lichty	I.E.,'33	Lampeter
Snavely, Harry Lichty	Arts,'36	Lampeter
Snyder, Frederick John, Jr.	Arts,'36	Mineola, N.Y.
Snyder, Milton Ulrich	Eng.,'36	Attica, N.Y.
Snyder, Ralph Ray, Jr.	Met.,'35	Harrisburg
Snyder, Richard Lee, Jr.	E.E.,'33	Glassboro, N.J.
Somers, William Eugene	M.E.,'33	Poland, O.

Sommer, Felix Marcus	Bus.,'33	Newark, N.J.
Sosna, Rudolph Joseph	Bus.,'34	Philadelphia
Spalding, Albert Ruff	Eng.,'36	Webster Groves, Mo.
Spector, Morton David	Bus.,'33	Philadelphia
Spencer, Walter Alan	Bus.,'35	Carbondale
Spengler, Elias Walter	Arts,'36	Bath
Spooner, Alfred Poole	Bus.,'35	East Aurora, N.Y.
Sprague, Kloman Westinghouse	Bus.,'36	Port Nelson, Ont., Canada
Squier, Clayton Lindsley	E.E.,'35	Madison, N.J.
Staller, John Russell	E.E.,'35	Schuylkill Haven
Stallings, William Benjamin	Bus.,'35	McKeesport
Stamm, Charles Henry, Jr.	Met.,'35	Mansfield, O.
Standing, Alfred John, Jr.	I.E.,'34	Bethlehem
Stefko, Edward	Arts,'36	Bethlehem
Stein, Donald Cleverly	Arts,'35	East Orange, N.J.
Steinberg, David Mitchell	Arts,'36	Newark, N.J.
Stemler, David Reuben	E.E.,'35	East Mauch Chunk
Stemp, Francis Albert	Eng.,'36	Baltimore, Md.
Stender, Herman Gilbert	C.E.,'34	Scranton
Stern, Gates Barnet	Arts,'36	Uniontown
Stern, Sidney Edwin	Bus.,'34	East Orange, N.J.
Stichler, Paul James	Ch.E.,'35	Kutztown
Stieg, Fred Bacon, Jr.	Eng.,'36	Parlin, N.J.
Stiles, Samuel Robert	Ch.E.,'35	Moorestown, N.J.
Stillwell, Frederick, Jr.	Eng.,'36	Huntington, N.Y.
Stitzer, Donald Joseph	Eng.,'36	Wyomissing
Stobaeus, John Baptist, Jr.	Bus.,'34	South Orange, N.J.
Stoflet, Charles Harry	Bus.,'35	Pen Argyl
Stone, Joseph Knox, Jr.	Eng.,'36	Beaver
Stopp, Joseph Edward	Eng.,'36	Germantown
Story, George Shaw	Bus.,'36	New Rochelle, N.Y.
Stout, Louis Sherwood	Bus.,'36	Irvington, N.J.
Straub, Theodore Alfred, Jr.	I.E.,'34	Canonsburg
Strausburg, Morris Oscar	Bus.,'34	Brooklyn, N.Y.
Strawbridge, Joseph Kauffman	Arts,'33	Rome, N.Y.
Strub, Henry Michael	Ch.E.,'34	Williamsport
Strubhar, Paul Daniel	Met.,'34	Pottstown
Struble, Louis Price, Jr.	M.E.,'35	Westfield, N.J.
Stuliz, Frank Paul	Arts,'34	Hollidaysburg
Stupp, Russell William	E.E.,'34	Lemoyne
Stutz, Lawrence Oliver	I.E.,'35	Washington, D.C.
Suvalsky, Matthew	Arts,'34	Malden, Mass.
Swain, Dean Hart	Eng.,'36	Trenton, N.J.
Swalm, John Moffatt, Jr.	Eng.,'36	Pottsville
Sweeney, Harold Joseph	Bus.,'34	West Pittston
Swope, Robert Leibert	I.E.,'35	Washington, D.C.
Sykes, Roy Arnold	Bus.,'33	Paterson, N.J.
Taddeo, William	Eng.,'36	Reading

Taft, John Rockwell	Bus.,'33	Maplewood, N.J.
Tanenbaum, Edward Poster	Arts,'36	New Rochelle, N.Y.
Tate, Thomas Edmund	Eng.,'36	Washington, D.C.
Taussig, Elwood Melcher, Jr.	Eng.,'36	Philadelphia
Tavormina, Louis	Bus.,'35	Rockville Centre, N.Y.
Taylor, Floyd Thomas, Jr.	Bus.,'35	Fairfield, Conn.
Taylor, Jeremiah Cosdin Price	M.E.,'35	Perry Point, Md.
Taylor, Norman William	Eng.,'36	Allentown
Taylor, Richard Greenleaf	Bus.,'34	Corning, N.Y.
Taylor, Robert Scott	Ch.E.,'33	Pottsville
Taylor, Walter Robinson	C.E.,'34	Philadelphia
Taylor, William John, Jr.	Ch.E.,'33	Pottsville
Tempest, James Alvin	Arts,'33	Catasauqua
Tether, Joseph Edward	Arts,'34	Hawley
Thomas, Albert Paudling	C.E.,'33	Flushing, N.Y.
Thomas, David Pryse	Arts,'35	Elmhurst
Thomas, Karl Parker	Eng.,'36	Taylor
Thomas, Walter Evans	Eng.,'36	Lansford
Thompson, Howard Emil, Jr.	Eng.,'36	Westfield, N.J.
Thompson, William Samuel	E.M.,'35	Washington, N.J.
Thompson, Lancey	Bus.,'36	Rahway, N.J.
Thorn, Ernest Wesley	Bus.,'36	Bethlehem
Thropp, William Richard	Eng.,'36	Trenton, N.J.
Tichenor, Harold Wade	Bus.,'34	Maplewood, N.J.
Tiefenthal, Herbert Milton	Bus.,'33	New York, N.Y.
Tiefenthal, Robert Paul	Bus.,'36	New York, N.Y.
Timmins, Claire Henry	Ch.E.,'35	Shenandoah
Tinley, Edward Snyder	E.E.,'35	Allentown
Titelman, Leonard Robert	Bus.,'34	Philadelphia
Todd, Willis Herbert	Bus.,'36	Roselle, N.J.
Toffey, William Vermilye, III	Phys.,'35	Jersey City, N.J.
Tomb, Charles Emerson	C.E.,'33	Coopersburg
Topping, Charles Edmund	C.E.,'35	New York, N.Y.
George	I.E.,'33	South Orange, N.J.
Towers, William Lindsay	C.E.,'35	Cranford, N.J.
Towle, Charles Lutge	Arts,'35	Great Neck, N.Y.
Travis, LeRoy Otten	Bus.,'35	Allentown
Trevena, Lewis Wenner	Eng.,'36	Schenectady, N.Y.
Troy, Matthew Orpheus, Jr.	Phys.,'35	Easton
Truell, Rohn	Eng.,'36	Pleasantville, N.J.
Trumbore, Franklin Dixson	Ch.E.,'35	Forest Hill, Md.
Tucker, Barclay Earl	Met.,'34	Ridley Park
Turner, Charles Alexander, Jr.	Bus.,'36	Ridley Park
Turner, Robert Justice	Arts,'35	Gillett
Tuton, John Walter	Eng.,'36	Wilkes-Barre
Tuttle, Edward Bishop	M.E.,'33	Wilkes-Barre
Tuttle, Norman Judd	Arts,'35	Trenton, N.J.
Twitchell, William Walling	Arts,'34	Baltimore, Md.
Tyler, James Edward, III	Arts,'36	Baltimore, Md.
Tyler, William Gurdon, Jr.		

Uhrich, Morris Bordner	C.E., '33	Myerstown
Ulak, Brunislaus Stephen	Eng., '36	Camden, N.J.
Umlauf, Edward William	M.E., '35	Kulpmont
Urken, Karl	Arts, '34	Trenton, N.J.
VanBilliard, Charles Adam	Bus., '33	Bethlehem
Van Campen, Ebling Daniell	Bus., '36	Youngstown, O.
VanDusen, Albert Newton	Bus., '33	East Orange, N.J.
vanHorn, Frank John	I.E., '33	Scranton
VanInwegen, Charles F.	Bus., '36	Port Jervis, N.Y.
VanScoy, Alfred Davitt, Jr.	Eng., '36	Bradford
vanWulven, Paul Evrard	Met., '35	Tenafly, N.J.
Victory, Homer Jerome	Eng., '36	Atlantic City, N.J.
Voehl, George Allison	Eng., '36	Dunellen, N.J.
Voit, Edward William	I.E., '33	Warren, O.
Volkmuth, Albert Roman	Eng., '36	Maplewood, N.J.
Voorhees, Malcolm Duncan	Bus., '36	Morrisville
Voorhees, Winthrop Dayton	I.E., '34	Summit, N.J.
Voss, Henry Alfred	Bus., '33	Brooklyn, N.Y.
Wagenseil, William Oswald	Eng., '36	Mount Vernon, N.Y.
Wagman, Francis Christopher	C.E., '35	Dallastown
Wagoner, Richard Henry	Eng., '36	Carlisle
Wadelich, Donald Long	Eng., '36	Allentown
Wainwright, Henry Vedder	Ch.E., '34	Manasquan, N.J.
Wait, Harold Vary	M.E., '34	Houston, Tex.
Walker, Frederick Wiley, Jr.	Eng., '36	Milwaukee, Wis.
Walker, Harry Samuel	I.E., '33	West Chester
Wall, Alfred Samuel	E.E., '34	Asbury Park, N.J.
Wall, Robert Bates	I.E., '33	Chattanooga, Tenn.
Walling, Frank Edward	Met., '34	Middletown, N.Y.
Waltz, Charles Hoffman	I.E., '34	Bethlehem
Wantuck, Stephen John	Eng., '36	Perth Amboy, N.J.
Warendorf, Harry, II	Bus., '33	Hollis, N.Y.
Warmkessel, Carl Andrew	Arts, '36	Allentown
Warner, Edward Everts	Eng., '36	Salisbury, Conn.
Warren, Charles Bartlett	Arts, '36	Westfield, Mass.
Warren, William Bradford	Bus., '33	Westfield, Mass.
Watkins, David Oliver	Eng., '36	Bethlehem
Watkins, Herbert Allen	Eng., '36	Wilkes-Barre
Watson, Albert Stackhouse	Bus., '36	Allentown
Webb, Alfred Mohr	Arts, '35	Allentown
Weber, John Christian	Bus., '35	Hazleton
Webster, William Henry Clothier	Met., '34	Philadelphia
Weicker, Raymond William	Arts, '35	Jamestown, R.I.
Weidner, Charles Leslie	Ch.E., '34	Carlisle
Weigel, Albert Schofield	Eng., '36	East Orange, N.J.
Weil, William Seligman, Jr.	E.E., '35	Philadelphia
Weill, Victor	Arts, '34	Mount Vernon, N.Y.
Weimer, Ralph Louis	Eng., '36	Nutley, N.J.
Weiner, Alex Edward	Arts, '33	Brooklyn, N.Y.

Weintraub, Isadore	Arts,'35	Valatie, N.Y.
Weisenbach, Frederick William	M.E.,'35	Wayne
Weisman, Joseph	Arts,'35	Poughkeepsie, N.Y.
Weiss, Bernard Samuel	Eng.,'36	Philadelphia
Weiss, Dion	E.E.,'35	Jersey City, N.J.
Weitzel, Paul Huber	I.E.,'35	Manheim
Weldon, Robert George	Ch.E.,'34	Mount Vernon, N.Y.
Weldy, George Henry	Eng.,'36	Tamaqua
Werner, Frederick Albert	Eng.,'36	Philadelphia
Werner, Melvin Otto	Bus.,'34	Nazareth
Wesley, Lester Raymond	Eng.,'36	Haddonfield, N.J.
Wheeler, William Sprague, Jr.	Bus.,'36	New Castle
Whetson, Charles Albert, Jr.	Bus.,'36	Winnetka, Ill.
White, Alonzo	Eng.,'36	Matawan, N.J.
White, William Mansfield	Eng.,'36	Utica, N.Y.
Whitney, Sumner Brown, Jr.	Bus.,'35	Brooklyn, N.Y.
Widdowfield, Arthur Samuel	E.E.,'33	Scranton
Widmer, Kemble	Eng.,'36	Ridgefield, Conn.
Wilder, Paul Cogswell	Eng.,'36	Attica, N.Y.
Wildman, Eugene Lee, Jr.	M.E.,'34	Baltimore, Md.
Wilkens, William John	Bus.,'36	New York, N.Y.
Willenbecker, James Frederic	E.E.,'33	Allentown
Williams, Edwin Samuel, Jr.	M.E.,'35	Mount Vernon, N.Y.
Williams, Howard Switzer	I.E.,'35	Summit, N.J.
Williams, John Geyer	M.E.,'33	Bethlehem
Williams, John Joseph	Ch.E.,'34	Bethlehem
Williams, John Roger	Bus.,'35	Philadelphia
Williams, Miller	I.E.,'34	Philadelphia
Williams, William Rendell, Jr.	C.E.,'35	Philadelphia
Willis, Richard Lewis	M.E.,'33	Harrisburg
Wilson, Fred, Jr.	C.E.,'35	Reisterstown, Md.
Wilson, James Murray Russell	Bus.,'36	Philadelphia
Wilson, Richard MacDonald	Eng.,'36	Pitman, N.J.
Wilson, Verne Rumbaugh	Eng.,'36	Wilmington, Del.
Wilson, Walter Edward	Arts,'36	Brooklyn, N.Y.
Winblad, Wilbur Charles	Bus.,'34	Brooklyn, N.Y.
Winco, Lawrence Anton	Eng.,'36	Philadelphia
Winkler, David Waldemar	Ch.E.,'33	Bethlehem
Winship, Benjamin Wesco, Jr.	Eng.,'36	Orchard Park, N.Y.
Wisner, Edwin Reinhold	I.E.,'33	Sewickley
Wiswesser, William Joseph	Eng.,'36	Reading
Withrow, William Edgar	E.E.,'33	Manasquan, N.J.
Witmer, Benjamin Franklin	C.E.,'34	Lancaster
Witt, Gustive Edward	Eng.,'36	Mineola, N.Y.
Wolcott, George Linton	Arts,'34	Red Bank, N.J.
Wolf, Meyer	E.M.,'35	New York, N.Y.
Woodcock, Robert Dudley, Jr.	M.E.,'35	Rockville Centre, N.Y.
Woodrich, Frederick William	Eng.,'36	Minneapolis, Minn.

Woodring, William Boone	Eng.,'36	Bethlehem
Woodsum, Edmund Nugent	Bus.,	Allentown
Worth, John Sharpless	Met.,'33	Bethlehem
Wright, James Robert	Arts,'35	Philadelphia
Wurster, George Henry	Eng.,'36	Haddon Heights, N.J.
Wyatt, John Raymond	Arts, 35	Martinsville, N.J.
Wyman, Herbert George	Bus.,'35	Glen Ridge, N.J.
Yaffe, Charles	Bus.,'33	Reading
Yates, Donald Curtis	Bus.,'36	White Plains, N.Y.
Yeager, Ransom Gerdon, Jr.	Bus.,'36	Akron, O.
Yerrick, Charles Rush, Jr.	Bus.,'34	Scranton
Yotter, Richard Kinsey	Bus.,'34	Easton
Young, George McAlpine	Arts,'36	Cumberland, Md.
Young, William Cope	E.E.,'33	East Orange, N.J.
Youngblood, Robert Nixon	I.E.,'33	Wilkes-Barre
Youngerman, Abraham Arnold	Arts,'35	New York, N.Y.
Zabriskie, Harold Benedict	C.E.,'33	North Hackensack, N.J.
Zacharias, Edward E., Jr.	Eng.,'36	Philadelphia
Zettlemoyer, Albert Charles	Eng.,'36	Allentown
Zimmerman, David Albright	Bus.,'36	Flushing, N.Y.
Zimmermann, William Adam	Arts,'35	Lancaster
Zuckerman, Albert	Bus.,'35	Philadelphia
Zumeta, Julio, Jr.	M.E.,'35	Habana, Cuba
Zwickly, Arnold Melchior	Eng.,'36	Berkshire Heights

SPECIAL STUDENTS

Keen, Benjamin	Arts	Bethlehem
Krack, Ernest Edward	C.E.	Brooklyn, N.Y.
Landis, William Thomas	Arts	Allentown
Zeigler, Paul Philip	Met.	York

SUMMER SESSION, 1932

Ackerson, Cornelius	Keyport, N.J.
Agocs, William Bailey	Freemansburg
Albright, Louise, A.B. (<i>Cedar Crest College</i>)	Allentown
Alexander, Elbert Nicholas	Abington
Allen, Edna May, Ph.B. (<i>Muhlenberg College</i>)	Allentown
Allison, Robert Price	Schenectady, N.Y.
Anamisakis, Anthony Fotis	Bethlehem
Anderson, George Russell, B.S. (<i>Pennsylvania State College</i>)	Bangor
Anderson, Malcolm	New York, N.Y.
Aucott, William Connery	Philadelphia
Ayer, Fosdick Whitney	Plainfield, N.J.
Bailey, Albert Tanner, Jr.	Montclair, N.J.
Bailey, Benjamin Cook	Wallingford, Conn.
Baillie, John William	Bethlehem
Baker, Arthur Ephraim	Jamaica, N.Y.
Barnes, Allen Earl, Jr.	Philadelphia
Barney, Jerome	Wilkes-Barre
Battenberg, Paul Royl	Allentown
Beacher, Benjamin Donald	Allentown
Beal, Thomas James	Myersdale
Beale, William Lippe	Washington, D.C.
Beary, Joyce Elizabeth, B.A. (<i>Moravian College for Women</i>)	Allentown
Beiter, Harry Nevison	Elyria, O.
Bell, James McKim, Jr.	Rio de Janeiro, Brazil
Belser, Anthony Albert, Jr.	Plainfield, N.J.
Belzner, Edna Emmaline, Ph.B. (<i>Muhlenberg College</i>)	Bethlehem
Bene, Frank	Bethlehem
Benner, Henry Lester	Lederach
Bewley, Frank Wilson	Pottstown
Bleam, Althea Gertrude, A.B. (<i>Cedar Crest College</i>)	Allentown
Bloom, Kenneth Gordon	Agawam, Mass.
Bock, Charles Frederick	Caldwell, N.J.
Bonnett, Horace Wilson	Aberdeen, Md.
Boquel, Francis Peter	Bethlehem
Borton, Richard Alwyn	South Orange, N.J.
Boyd, Robert Putnam	Staten Island, N.Y.
Brand, Walter Johann (<i>Western State College of Colorado</i>)	Gunnison, Col.
Branda, Richard Randolph	Hamilton, Ont., Canada
Braunberns, James Edward	Warren, O.
Breslin, Jennie Margaret, B.S. in Ed. (<i>Indiana State Teachers' College</i>)	Lansford
Brobst, William Charles	Palmerton

Brown, Ralph Wilson	Plainfield, N.J.
Brown, Theodore Aulenbach, B.A. <i>(Moravian College)</i>	Bethlehem
Brownlee, John Frederick	Geneva, N.Y.
Buck, Richard Benn	Williamstown, N.J.
Burger, James Wendell, A.B. <i>(Haverford College)</i>	Lebanon
Burhouse, William Alfred	Drexel Park
Cahalan, William James	East Orange, N.J.
Campbell, Charles, Jr.	Fullerton
Capozzola, Joseph	Pen Argyl
Carl, Howard Frederick	Washington, D.C.
Carlile, Norman Alfred Henry	Philadelphia
Case, Roy Irving, II	Racine, Wis.
Cavanagh, William Edward, Jr.	Newark, N.J.
Cavin, Samuel Stewart	Upper Darby
Chickering, Edwin Shepard	Oil City
Clauss, Theodore Joseph	Brooklyn, N.Y.
Cleaveland, Jeanette Ide	Bethlehem
Cliver, Laurence Gordon	Tottenville, N.Y.
Close, Courtney Taft	Dunmore
Coffin, Stanley Nelson	Bethlehem
Colbaugh, Robert Crawford, Jr.	Wilkinsburg
Colitz, Michael John	McAdoo
Collander, Carl Edward	Newark, N.J.
Collins, Edmund, III	Allentown
Connelly, John Robert, B.S. in M.E., M.S. <i>(University of Illinois)</i>	Bethlehem
Cooley, Charles Freeland	Pennington, N.J.
Cooper, Donald Treat	Philadelphia
Cranmer, Richard Stephen	Philadelphia
Cressman, Alton John	Cementon
Crighton, Clarendon Nelson	Johnstown
Crocco, Samuel Robert	Weedville
Crocker, Ernest Newcomb	Philadelphia
Czel, James Eugene, Jr.	Bridgeport, Conn.
Danser, Lowry Scattergood	Yardley
Davis, Berton Emerson	Scranton
Davis, William Robert	Lansford
Deacy, William Henry, III	Ossining, N.Y.
deBerardinis, Vincent Anthony	Chester
Decker, Lemoyne Eugene	Harrisburg
DeGray, Elnora Garber	Bethlehem
Deily, Richard Leo	White Plains, N.Y.
Del Favero, Louis Vincent	Columbia, N.J.
Demarest, Harold Hunt	Bloomfield, N.J.
deMeli, Henry Anthony	New Brighton, N.Y.
Dengel, Arthur John	Westbury, N.Y.
Dengler, Robert Meyer	Shenandoah

Denise, Charles Meirs, Jr.	Bethlehem
DeTurk, Elder Pattison	Reading
Deweese, George Malcolm	West Chester
Dieffenbach, John Bauer	Westfield, N.J.
Diener, Karl Miller	Hamburg
Dietz, Carl Alford	Summit, N.J.
Dolliver, Charles Marvin, Jr.	North Plainfield, N.J.
Dougherty, Esther Cecelia	Bethlehem
Dow, Langdon Cheves	Trucksville
Dudchenko, Dimitriy	Russia
Erich, Robert Allen George	Bethlehem
Eby, Martin Christian	New Holland
Eckles, Charles Cook	New Castle
Edraney, Stephen Edward	Bethlehem
Egleston, Richard Prosser	Upper Darby
Eichelberger, Lewis Hay, Jr.	Eagle Pass, Tex.
Ellis, Harry Kaler, Jr.	Phoenixville
Ellison, Stanley Russell	South Orange, N.J.
Enscoe, Roger	Port Washington, N.Y.
Enzian, George Henry, II	Fairmont, W.Va.
Evans, John Orville	Washington, D.C.
Evans, Morton Ridgway	Glen Rock, N.J.
Everett, Harvey James	Allentown
Eyster, Franklin Spangler	York
Fairer, Stanley Bush, B.S.	Easton
<i>(Lafayette College)</i>	
Fay, Joseph Edmund	West Pittston
Fehr, Harold George	Pen Argyl
Fellman, Francis Lewis	Eastview, N.Y.
Ferry, John Jude	Bethlehem
Filer, Frank P.	Mercer
Fink, Lawson Jeremiah, A.B.	Albany
<i>(Muhlenberg College)</i>	
Fisher, Harry Mueller	Drexel Hill
Fisher, Karl Albert	Kutztown
Flink, Ellis Morton	Providence, R.I.
Foering, Howard Augustus, Jr.	Bethlehem
Foland, Jackson Edward	North Plainfield, N.J.
Folkner, Maurice Harvey	Buttzville, N.J.
Ford, Howard Holmes, Jr.	Ridgewood, N.J.
Frauenfelder, Lewis Jacob	Topton
Frazee, Edward Blackwell	Deal, N.J.
Frederick, Ralph Horace	East Greenville
Fritz, Charles Leslie	Westfield, N.J.
Fruehan, Willard	Scranton
Frutiger, Thomas William	Red Lion
Fuller, James Osborn	Bethlehem
Gabell, Boyden Richardson	Philadelphia
Gallagher, Edward Spring	Great Neck, N.Y.
Gallaway, William Smith	Rutherford, N.J.

Garber, John Franklin	Lumberville
Gates, Bernard Nieweg	Tyrone
Gearhard, Foster Lane	Palmerton
Genszler, William G., Ph.B. <i>(Muhlenberg College)</i>	Red Hill
Gibson, Glenn James	Hampton, N.J.
Gilmore, John Arthur	California
Gortner, John William, Jr.	Shamokin
Graef, Herman Frederick	Stapleton, N.Y.
Grafton, Herbert Sidney	Trenton, N.J.
Grainger, Thomas Hutcheson, Jr.	Allentown
Groman, Mary Louise, B.A. <i>(Syracuse University)</i>	Bethlehem
Gum, Warren Speer	Pen Argyl
Gummere, William, Jr.	Trenton, N.J.
Guyer, John Packer, Jr.	Harrisburg
Hammer, Fred Robert	New Haven, Conn.
Harding, William Cashmore	East Orange, N.J.
Harris, William Thalheimer, Jr.	Allentown
Hart, John Henry, Jr.	Bethlehem
Hartman, Roland Franklin, B.S., Ph.B. <i>(Lehigh University, Muhlenberg College)</i>	Allentown
Haupt, Harry Crickard, Jr.	York
Hauserman, Ben Martin	Cleveland Heights, O.
Heath, Emma Gertrude	Bethlehem
Heether, Ernest Joseph	Williamsport
Heiberger, Charles Adam	Allentown
Heller, Edward Lincoln	Palmerton
Helms, Samuel Britton	Philadelphia
Hendricks, Marshall Joshua	Allentown
Hennings, Harold	Jersey City, N.J.
Henrick, Willis Mark	Pottstown
Hertel, Charles Clement, Jr.	Ridgewood, N.J.
Hill, Harry Logan	Baltimore, Md.
Hinkle, Harold Eugene	Bethlehem
Hodapp, Walter Leonard	Maplewood, N.J.
Hoffman, George Woodrow	Irvington, N.J.
Hollister, Frank Joseph	Sea Cliff, N.Y.
Holme, Justus Mitchell, B.S. in C.E. <i>(University of Pennsylvania)</i>	Philadelphia
Holme, Thomas Timings	Philadelphia
Holmes, Lawrence John, Jr.	Allentown
Hoppes, Charles William	Frackville
Horn, Woodrow Washington	Bangor
Houston, Allan Frederick	River Forest, Ill.
Howells, George Benjamin	Hanover
Hoyt, Jack Garland	Berwick
Hutchinson, William Baxter Myers	Bethlehem
Hutt, Milton Howard	Egg Harbor City, N.J.
Illick, Montford Elroy, B.S. <i>(Lafayette College)</i>	Hellertown

Jackson, Charles Marcellus	Philadelphia
Jackson, Robert Bickley	Drexel Hill
Jacobi, Walter Munhall	Bayonne, N.J.
Jasper, Richard Newton	Mount Vernon, N.Y.
Johnson, William Austin	Washington, D.C.
Jordan, Thomas Benjamin	South Orange, N.J.
Jurden, Wilbur Lawrence	Mount Vernon, N.Y.
Kaesemeyer, Charles Cassard	Hazleton
Kalisky, Leopold Mitchell	Brooklyn, N.Y.
Kane, Joseph Charles	Millville, N.J.
Keat, Donald Bonney, B.S. <i>(Lafayette College)</i>	Bangor
Kehoe, John Edward	Bethlehem
Keim, Charles Junior	Pottsville
Keller, Alfred William	Summit, N.J.
Kelley, Walter Harvey, Jr.	Bethlehem
Kennedy, Earl Frederick	New Bloomfield
Kennedy, Frank Stewart	Llanerch
Kildebo, Howard Martin	Hazleton
King, Donald Milton	Bala-Cynwyd
Klausmann, Milton Harry	Maplewood, N.J.
Klein, Charles Anthony	Allentown
Klippert, Henry Laessle	Mountain Home
Koffel, Catharine Isadora, B.A. <i>(Moravian College for Women)</i>	Bethlehem
Kopp, Paul Joseph	Allentown
Korayne, Theodore Desiderius	Babylon, N.Y.
Kotanchik, Nicholas Walter	Ranshaw
Kress, John Harner	Pittsburgh
Kriebel, Denton Henry, Ph.B. <i>(Muhlenberg College)</i>	Allentown
Kuhl, William Frederick, Jr.	Allentown
Kuhns, Charles Henry	Allentown
Kulp, Samuel Randall	Bethlehem
Lafferty, Isabel Morrison, A.B. <i>(Oklahoma City University)</i>	Bethlehem
Landis, Robert Prince	Old Greenwich, Conn.
Lange, George William	Flushing, N.Y.
Larkin, Franklin John	Bethlehem
Lauer, Franklin Richard	Lansford
Laury, Joseph Ellis, B.A. <i>(Muhlenberg College)</i>	Bethlehem
Leibfried, Mildred Louise	Bethlehem
Leidich, Edwin Enos, B.S. <i>(Muhlenberg College)</i>	Catasauqua
Leitner, Frederick, B.A. <i>(Lehigh University)</i>	Bethlehem
Lentz, John Bethke, B.A. <i>(Ursinus College)</i>	Collegeville
Liggett, Thomas, III	Jenkintown

Lindabury, Richard Nicholas	Burlington, N.J.
Litsch, Alice Marie	Bethlehem
Long, Austin Kunsman	Freemansburg
Long, Melvin LeRoy	Muncy
Lore, Henry Edgar	Brigantine, N.J.
Lovett, Albert Burbank	East Orange, N.J.
Lutz, Curwen William	Perkasie
MacDonald, Charles Grant	Norwalk, Conn.
MacGuffie, James	West Orange, N.J.
Maguire, Kenneth Faust	Mahanoy City
Malinowski, Francis Xavier	Harrisburg
Mallison, Robert Charles	Pottstown
Manos, Teddy Michael	Greensburg
Maratta, William Zimmerly	Coraopolis
Marcks, Carl Arthur	Nazareth
Marks, Robert Edwin	Allentown
Martin, Harry Charles Coakley	Glen Rock, N.J.
Martin, William Stockton, Jr.	Stratford, N.J.
Martinsen, Richard Ottocar	Newton, N.J.
Matesky, Solomon Joseph	Bethlehem
Matthews, John Hanson	Newark, N.J.
Maynard, William Benz	Paterson, N.J.
McBane, Alan Hubert	Aliquippa
McBride, Charles Rhoades	Oakmont
McClintic, Richard Ridge	Pittsburgh
McConahey, Hugh Milner	Wilkinsburg
McGinley, Edward Eugene	Allentown
McGovern, John Joseph	Bethlehem
McKechnie, Edward	Denver, Col.
McKeever, Roy Samuel, B.A. <i>(Western Reserve University)</i>	Egypt
Meissner, Milton	Plainfield, N.J.
Merkel, Roy Thomas, B.S. <i>(Franklin and Marshall College)</i>	Topton
Merritt, George Jester	Wilmington, Del.
Metzger, Esta Eleanor, Ph.B. <i>(Muhlenberg College)</i>	Allentown
Michaelson, Stanley Day	Brooklyn, N.Y.
Miller, Frank Bott, Jr.	Greensburg
Miller, Harold Yach	Lyndhurst, N.J.
Miller, Marlin Charles	Donaldson
Miller, Walter Samuel	California
Milliken, Thomas Henry	Pittsburgh
Mollenauer, William Emery	Canonsburg
More, Florence Esther, B.A. <i>(Mount Holyoke College)</i>	Bethlehem
Morgan, Frank Benedict	Dunmore
Morris, Henry Sanford, II	Woodbury, N.J.
Morse, John Alfred	Scranton
Musselman, Casper Rosenstock	Bethlehem

Musser, Shelton Arthur	Reading
Neely, John DeMont	Latrobe
Neiman, Charles Herman	York
Nemzek, Francis Edwal	Westfield, N.J.
Newhard, Stella Elizabeth, Ph.B. <i>(Muhlenberg College)</i>	Allentown
Nicherson, Philip Gurney	Pittsburgh
Nilan, John Joseph, Jr.	Bergenfield, N.J.
Nissler, Leonora Martha	Bethlehem
Nissley, Samuel Brandt	Salunga
Nivin, David Traver	Bethlehem
Nolfi, Emil Leo	Glen Lyon
Norman, Edward Alfred, Jr.	West Englewood, N.J.
Norwood, Hayden Eugene	Bethlehem
Ock, Harold David	Brooklyn, N.Y.
Okuno, Clifford Kaiei	Delaware Water Gap
Olofson, Carl Theodore	West Orange, N.J.
Olofson, Earl Clifford	West Orange, N.J.
Oplinger, Arthur John Griffith, Ph.B. <i>(Muhlenberg College)</i>	Hellertown
Oskin, William Walter	Bethlehem
Osman, Albert Edward	Bridgeport, Conn.
Osterstock, Louis Henry	Irvington, N.J.
Palmer, Anne-Marie	Bethlehem
Parassio, Anthony Vincent	Camden, N.J.
Partridge, Seymour Truman	Northville, N.Y.
Paterno, Joseph Albert, Jr.	Trenton, N.J.
Paulsen, Edgar Peter, B.S. <i>(Muhlenberg College)</i>	Lehighton
Payne, Elizabeth, B.A., M.A. <i>(Wellesley College, University of Chicago)</i>	Bethlehem
Payrow, Harry Gordon, B.S. in C.E. <i>(Tufts College)</i>	Bethlehem
Payson, Lillian Gordon	Bethlehem
Peck, Marcel Kahle	Charleston, W.Va.
Pharo, Charles Budd, Jr.	Trenton, N.J.
Pisarev, David Connells	Bethlehem
Platt, Doran Stone, Jr.	Washington, D.C.
Polatchek, Jerome Julius, E.M. <i>(Lehigh University)</i>	Bethlehem
Powell, George Farabaugh	Altoona
Pratt, Raymond Morrison	York
Purdy, George William	Englewood, N.J.
Purdy, James Elliott	Lansford
Purnell, Forest Clarence James	Pottstown
Putnam, Kent Sayre	Bethlehem
Quinn, Joseph Aloysius	Pittston
Rader, Milton James	Easton
Ready, Claude Henry, Jr.	Shamokin
Redline, Harold Samuel	Bethlehem
Regar, Philip Waters	Collegeville

Retzer, William Raymond	Deposit, N.Y.
Rick, Richard	Reading
Rife, Charles Jacob	Lemoyne
Rights, Fred Lewis	Bethlehem
Riss, Gustav Anton	Cleveland, O.
Ritter, Ferman Thomas	Easton
Roach, Albert Kemmerer	Easton
Robar, Henry John	Bethlehem
Roberts, Frank Stuart	Wilkes-Barre
Roberts, John Douglas	Sharon Hill
Roberts, John Wesley	Slatington
Robinson, Mary Rebecca	Bethlehem
Root, Benjamin Mylin	York
Roper, Charles Garland	Petersburg, Va.
Roper, John Nathaniel, Jr.	Petersburg, Va.
Rossetti, Andrew, Jr.	Allentown
Russell, George Burton	East Hampton, N.Y.
Ryan, Michael Joseph, B.A. <i>(Lehigh University)</i>	Bethlehem
Sandercock, Charles Hulbert	Scranton
Sandwick, Charles Martin	Elmira Heights, N.Y.
Saricks, George Frederick, Jr.	Freeland
Schaeffer, Judson Letterhouse	Bethlehem
Schaffer, Elwood Joseph	Bath
Schal, George Richardson	Oradell, N.J.
Schappel, Joseph William	Allentown
Schellenberg, Edward John, Jr.	Englewood, N.J.
Schlotter, Elwood Steffan, Ph.B. <i>(Muhlenberg College)</i>	Bethlehem
Schmidt, James	Wilkes-Barre
Schmidt, John George	York
Schmoyer, Frederick Peter	Allentown
Schneck, Ivan Peter	Schnecksville
Schneider, Frederick Cortlandt, Jr.	New Haven, Conn.
Scholl, Harold Nevin	Earlington
Scholla, Paul Frederick	Dunmore
Schrope, Ray George	Tower City
Searle, William Baum	Carbondale
Seeley, Howard Wilson, Jr.	Woodcliff, N.J.
Seiler, Edwin William	Maplewood, N.J.
Seiple, Norman Kline, B.S. <i>(Muhlenberg College)</i>	Bethlehem
Serfass, Earl James	Allentown
Shackford, Charles Chauncey	Jamestown, R.I.
Shawin, Irving	Allentown
Shimer, Acton Jerome	Bethlehem
Shinn, Garrett Hance	Palmerton
Silimperi, Pasquale	Bethlehem
Sims, Ivor Donald	Bethlehem
Sitterley, Theodore Snyder	Bronxville, N.Y.
Skelly, John Scott, Jr.	Monongahela

Smith, Arnold Richard	Albany, N.Y.
Smith; Elmer Francis, Jr.	Roselle Park, N.J.
Smith, Agnes Clancy, B.A., M.A.	Bethlehem
<i>(Smith College, Columbia University)</i>	
Smith, Stanton McMasters, Jr.	Montclair, N.J.
Stahl, Gretchen	Allentown
Staller, John Russell	Schuylkill Haven
Stamm, Charles Henry, Jr.	Mansfield, O.
Standing, Alfred John, Jr.	Bethlehem
Steidle, William Jacob, B.A.	Jeddo
<i>(Lehigh University)</i>	
Stemler, David Reuben	Mauch Chunk
Stiles, Samuel Robert	Moorestown, N.J.
Stockton, Richard Austen	Buffalo, N.Y.
Stofan, Andrew John, B.A.	Freeland
<i>(Lehigh University)</i>	
Stofflet, Charles Harry	Pen Argyl
Stoughton, Merwin Roe	Bethlehem
Straub, Theodore Alfred, Jr.	Canonsburg
Stroman, James Brobst, B.A.	Bethlehem
<i>(Lehigh University)</i>	
Strub, Henry Michael	Williamsport
Stuart, Milton Caleb, B.S. in M.E., M.E.	Bethlehem
<i>(University of Pennsylvania)</i>	
Swope, Robert Leibert	Washington, D.C.
Taylor, Jeremiah Cosden Price	Perry Point, Md.
Taylor, Robert Scott	Pottsville
Taylor, William John	Pottsville
Thierolf, Russell Lloyd, B.S.	Bethlehem
<i>(Lafayette College)</i>	
Thoma, Harry Gould	Forty Fort
Thomas, Karl Parker	Taylor
Thompson, William Semuel	Washington, N.J.
Thropp, William Richard	Trenton, N.J.
Tinley, Edward Snyder	Allentown
Toffey, William Vermilye, III	Jersey City, N.J.
Tomb, Charles Emerson	Coopersburg
Towle, Charles Lutge	Cranford, N.J.
Townsend, Valence Alaire	Bethlehem
Travis, LeRoy Otten	Great Neck, N.Y.
Truell, Rohn	Easton
Trumbore, Franklin Dixson	Pleasantville, N.J.
Turner, Charles Alexander, Jr.	Ridley Park
Uhler, Ella Messenger	Allentown
Umlauf, Edward William	Kulpmont
VanScoy, Alfred Davitt, Jr.	Bradford
van Wulven, Paul Evrard	Tenafly, N.J.
Voorhees, Winthrop Dayton	Summit, N.J.
Wagman, Francis Christopher	Dallastown
Wagoner, Richard Henry	Carlisle

Wainright, Henry Vedder	Manasquan, N.J.
Waltz, Charles Hoffman	Kirkwood, Mo.
Ware, Allen Theodore	Glassboro, N.J.
Warmkessel, Carl Andrew	Allentown
Watkins, David Oliver	Bethlehem
Webber, Arthur Christian	Scranton
Weidner, Charles Leslie	Carlisle
Weil, William Seligman, Jr.	Philadelphia
Weiss, Dion	Jersey City, N.J.
Weitzel, Paul Huber	Manheim
Weldon, Robert George	Mount Vernon, N.Y.
Wentzel, Besse Martha, A.B. <i>(Moravian College for Women)</i>	Wilkes-Barre
Werner, Melvin Otto	Nazareth
Williams, Benjamin Crispin, Ph.B. <i>(Lafayette College)</i>	Catasauqua
Williams, Edwin Samuel, Jr.	Mount Vernon, N.Y.
Williams, Howard Switzer	Summit, N.J.
Williams, John Joseph	Bethlehem
Williams, Miller	Philadelphia
Williams, William Rendell, Jr.	Philadelphia
Wilson, Fred, Jr.	Reisterstown, Md.
Wilson, Walter Edward	Brooklyn, N.Y.
Winco, Lawrence Anton	Philadelphia
Witt, Gustive Edward	Mineola, N.Y.
Wolf, Meyer	New York, N.Y.
Wood, William Gilchrist	South Orange, N.J.
Woodcock, Robert Dudley, Jr.	Rockville Centre, N.Y.
Worth, John Sharpless, A.B. <i>(Swarthmore College)</i>	Bethlehem
Young, Dorris Redline	Bethlehem
Young, Frederick Frick, A.B. <i>(Lafayette College)</i>	Easton
Youngkin, Edward Herbert, B.S. <i>(Lafayette College)</i>	Easton
Zimmerman, David Albright	Flushing, N.Y.

SUMMARY OF STUDENTS BY CLASSES AND CURRICULA

Undergraduates	Seniors	Juniors	Sophomores	Freshmen	Special Students	Total
Arts and Science.....	46	54	64	71	2	237
Business Administration.....	65	84	89	112	....	350
Chemical Engineering.....	25	33	49	....	....	107
Chemistry	7	9	2	....	....	18
Civil Engineering.....	18	18	27	....	1	64
Electrical Engineering.....	17	19	24	....	....	60
Engineering Physics.....	4	2	8	....	....	14
Industrial Engineering.....	32	26	27	....	....	85
Mechanical Engineering.....	21	16	26	....	....	63
Metallurgical Engineering...	14	22	11	....	1	48
Mining Engineering.....	7	11	10	....	....	28
Freshman Engineering.....	....	....	....	303	....	303
Total	256	294	337	486	4	1377
Graduate Students						132
Undergraduate Students						1377
Students in Summer Session.....						436
Total, less duplications.....						1587

GEOGRAPHICAL DISTRIBUTION OF STUDENTS, 1932-1933

Alabama	4
Arizona	1
Colorado	2
Connecticut	28
Delaware	13
District of Columbia.....	22
Florida	3
Georgia	1
Illinois	9
Indiana	3
Kansas	1
Maryland	31
Massachusetts	19
Michigan	1
Minnesota	4
Missouri	2
New Jersey	370
New York	231
North Carolina	1
Ohio	22
Pennsylvania	782
Rhode Island	5
Tennessee	1
Texas	2
Utah	1
Vermont	1
Virginia	4
Washington	1
West Virginia	7
Wisconsin	4
Brazil	1
Canada	2
Canal Zone	1
Columbia	1
Cuba	2
Italy	1
Mexico	1
Russia	2

INDEX

Accounting, 87
Accredited schools, 29
Administrative officers, 23
Admission, 27
Advanced standing, 31
Alumni Association, 223
Alumni Memorial Building, 205
Alumni Prizes, 216
Arboretum, 207
Archer-Daniels-Midland Co. & Wm. O. Goodyear Co. Fellowships, 213
Armory, 206
Arts and Science, 27, 46
Astronomy, 155
Baldwin Fellowship, 213
Band, 194
Biology, 82
Botany, see **Biology**
Brink Fellowship, 213
Buildings and Grounds, 198
Business Administration, 27, 55, 86
Bylesby Fellowships, 212
Calendar, 3
Carson Prize, 215
Chandler Chemistry Lab., 198
Chandler Prizes, 215
Chemical Engineering, 62, 90
Chemistry, 64, 90
Chemistry Fellowships, 214
Christmas-Saucon Hall, 202
Civil Engineering, 66, 101
College Board Exams., 31
Coppee Hall, 202
Courses of Instruction, 82
Course Societies, 220
Coxe Memorial Fund, 210
Coxe Mining Laboratory, 201
Degrees conferred, 1932, 224
Dentistry, preparation for, 51
Description of courses, 82
Dispensary service, 219
Dormitories, 204
Drown Memorial Hall, 204
duPont Prize, 215
Eavenson & Levering Co. Fellowship, 214
Economics, 86
Education, 107
Electrical Engineering, 68, 113
Electrical Eng. Prize, 215
Engineering, College of, 28, 58
Engineering Physics, 70
English, 120
Entrance requirements, 27
Examinations for admission, 30
Expenses, 45
Faculty, 7
 committees, 21, 26
Fees and expenses, 42
Fellowships, 211
Financial Aid, 210
Fine Arts, 126
Founder's Day, 222
Fraternities, 222
Frazier and Ringer Fund, 211
French, 189
Fritz Engineering Lab., 200
Geology, 127
German, 133
Government, 142
Graduate courses, 32
Greek, 134
Haines Scholarship, 209
Health Service, 218
History, 137
Honorary societies, 220
Honors and prizes, 234
Hoppe Fellowship, 214
Hunt-Rankin Leather Co. Fellowship, 213
Industrial Engineering, 72, 161
Inspection trips, 61
Institute of Research, 197
Institute of Research Fellowships, 214
Italian, 193
Journalism, 53, 124
Late-registration fee, 43
Latin, 144
Law, preparation for, 52
Lehigh Field, 206
Library, 203
Mathematics, 149
Mechanical Engineering, 75, 155

Medicine, preparation for, 51
Mercer Scholarships, 209
Metallurgical Engineering, 78, 161
Military Sci. and Tactics, 167
Mining Engineering, 80, 170
Moral and Religious Philosophy, 174
Music, 175
N. J. Zinc Co. Fellowship, 212
Nostrand Scholarship, 209
Packard Electrical and Mechanical Laboratory, 206
Packard Fellowship, 213
Packer, Asa, Founder, 217, 222
Packer Hall, 198
Packer Memorial Church, 202
Phi Beta Kappa, 220
Philosophy, 176
Physical Education, 179
Physical examinations, 218
Physics, 182
Physics Laboratory, 199
Placement Service, 218
Political Science, see *History and Government*
President's Fund, 211
Price Hall, 204
Prizes and honors, 234
Prizes, 215
Psychology, 186
Public Speaking, 124
Refunds of fees, 43
Registration days, 3
Research Fellowships, 211
Reserve Officers' Training Corps, 167
Romance Languages, 189
Sayre Observatory, 202
Sayre Park, 207
Scholarships, 207
Sigma Xi, 220
Sociology, 90
Spanish, 191
Special students, 32
Student Chemistry Foundation, 214
Student organizations, 221
Student publications, 222
Students, 1932-1933, 241
Summer Session, 195
Tau Beta Pi, 220
Taylor Field, 206
Taylor Gymnasium and Field House, 205
Taylor Hall, 204
Teacher Placement, 218
Teaching, preparation for, 52
Theses, graduating, 218
Trustees, Board of, 5
Tuition, 42
University Day, 222
Wilbur Engineering Lab., 199
Wilbur Prizes, 215
Wilbur Scholarship, 208
Williams Fund, 211
Williams Hall, 200
Williams Prizes, 216
Zoology, see *Biology*



